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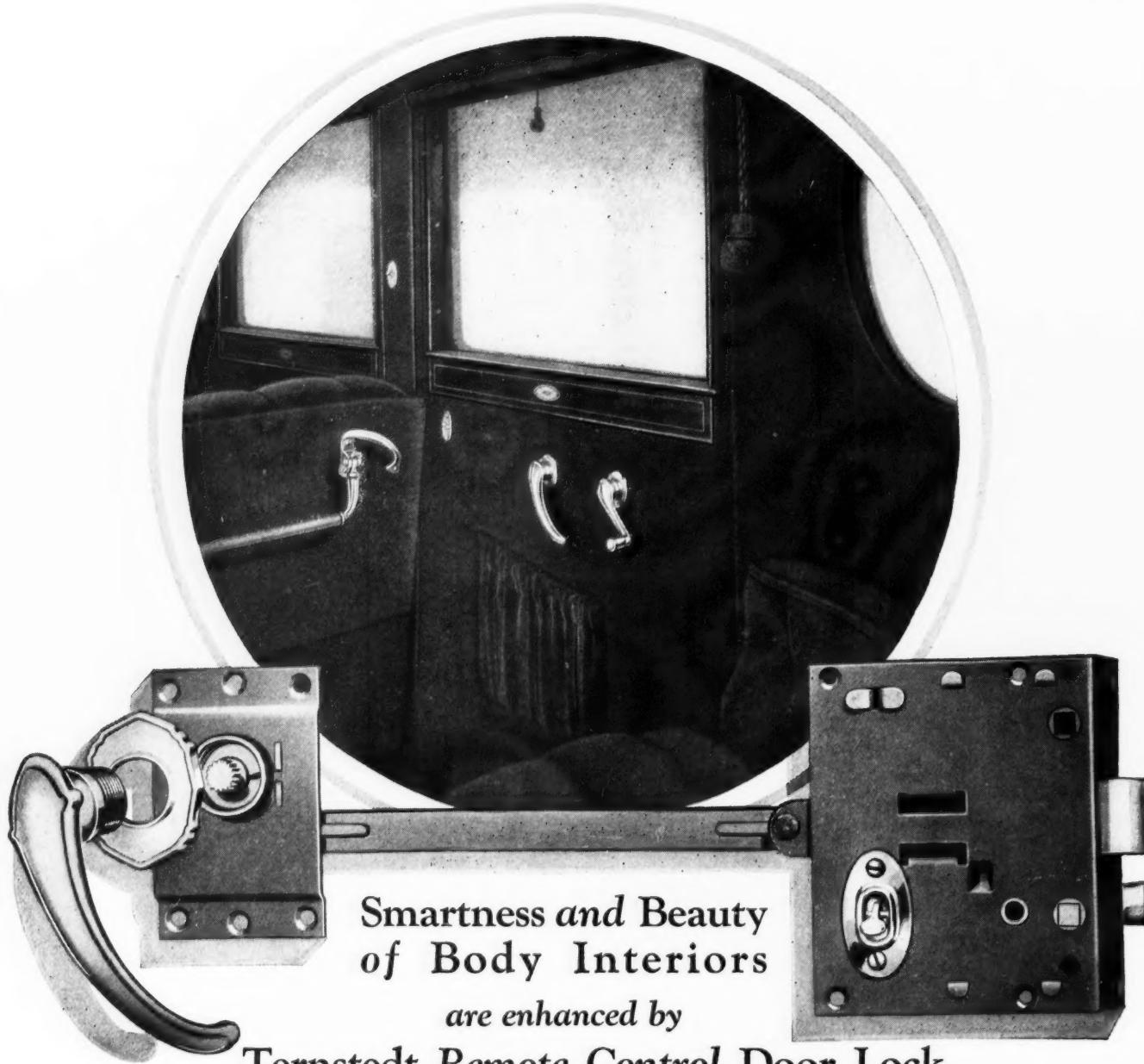
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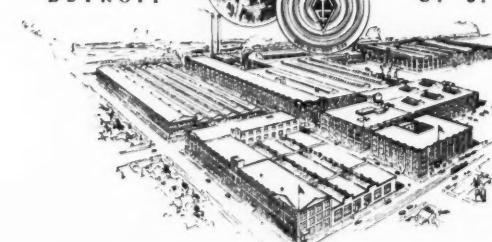
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AUTOMOTIVE INDUSTRIES

VOLUME 56

Philadelphia, Saturday, March 5, 1927

NUMBER 9

Industrial Research—Where the College Fits In

Institutional laboratories well equipped to carry on certain class of work which lies between scientific and industrial research and deserve financial aid.

By P. M. Heldt

THE question has been raised as to what part the college laboratories can play in industrial research work. J. H. Hunt brought the matter to the fore in a talk at a recent meeting of the Pennsylvania Section, Society of Automotive Engineers; it was debated pro and con at several of the sessions of the 1927 annual S. A. E. meeting in Detroit, and apparently it is a subject in which many automotive men are deeply interested at this time.

Mr. Hunt, president of the S. A. E., voiced the opinion that in most cases where a problem arises in industry a quick solution is very urgent and the institutional research laboratory cannot carry the work through with sufficient promptness. There is undoubtedly a foundation of fact for this statement and we can hardly expect manufacturing organizations which have well equipped research laboratories of their own to look to the colleges for help on pressing problems.

There is, however, a certain class of research work which may be regarded as intermediate between scientific and industrial research, for which the institutional laboratories are well equipped, and which, since it will benefit industry, the

latter can well afford to endow. A good example of this class is the research on the fatigue of metals which has been going on at the Illinois Engineering Experiment Station for many years. The work has been carried on systematically and painstakingly, and from the results concise conclusions have been drawn which should be of great help to designers, in all those cases at least where the working stresses can be fairly closely calculated in advance.

A similar line of work relates to the development of a method of measuring the intensity of sound or noise, which was started at the University of Michigan. Quite a number of machines and parts are sold with the understanding that their operation is to be reasonably noiseless, and the fact that so far there has been no method of accurately determining or measuring noise has resulted in many misunderstandings.

First results were published recently of a research on the factors which affect the amount of power absorbed by metal cutting tools, which is



now being carried on at the University of Michigan.

All of the lines of research work mentioned are of a character to interest entire industries. It would be very wasteful if every organization that could benefit from the results of such research should attempt to carry out the work in its own laboratory and keep the results to itself. The best plan evidently would be to have such work carried on in public institutions, to make the results public and to get the largest number of possible beneficiaries to contribute to the costs. How the financial problem can best be solved the writer will not attempt to say.

Strength of Gear Teeth

Another line of research work of this character is that on the strength of gear teeth, which is now under way at the Massachusetts Institute of Technology. At the present time, in calculating gears for strength, use is made of a formula evolved by Wilfred Lewis more than 30 years ago on purely theoretical grounds. While this has served fairly well in the absence of something better, the demand is for constantly greater accuracy, especially where high priced materials are used or light weight is essential. Mr. Lewis some time ago designed a machine by which it is sought to get at the various relations, such as the effects of inaccuracies and speed, on the strength. The work is being done in the Mechanical Laboratory of the M. I. T. and the fund with which the expenses are met has been liberally contributed to by members of the American Gear Manufacturers Association and others.

The college laboratory specially equipped for industrial research thus has a definite place in solving problems that are of very general interest, and it will be enlisted also in special problems by manufacturing concerns that have no research laboratory of their own.

Research of a scientific and technical nature always has been carried on chiefly at laboratories connected with the higher institutions of learning, and most of our present knowledge in physics and chemistry originated in these laboratories.

An immense amount of research was done at university laboratories during the nineteenth century in connection with electrical phenomena, radiation, the properties of gases, chemical properties of the elements, etc. Scientific thought and scientific experiment in the modern sense started only shortly before the beginning of the nineteenth century. Previous to that time the greatest experimenters had been the alchemists, whose point of view was entirely a utilitarian one, and whose work therefore was related more to that of the modern industrial research worker than to that of the scientist. Some of the results of these alchemists were of a truly industrial character, notably the discovery of a process of manufacturing porcelain by Boettger in 1710.

Industrial research has been carried on on a small scale for a long time, and perhaps more of it was done during the last half of the nineteenth century than a search of the technical literature of that period would lead one to believe. The doors of industrial laboratories usually are kept closed and the research workers are under pledge of secrecy, hence not much of what is going on in the laboratories reaches the outside world, except as it is embodied in commercial products developed or improved as a result of this research.

The great benefit which industry may derive from organized and properly directed research was strikingly demonstrated, probably for the first time, by the development of the coal tar derivatives industry in Germany. That aniline dyes could be made from coal tar was first discovered in England, by W. H. Perkin in

1856, and a coal tar dyes industry was started there. Later the subject was taken up in Germany, where a number of powerful organizations grew up that spent much money in the systematic working out of the chemistry of the coal tar derivatives, with such good results that just previous to the war Germany had practically a world monopoly on coal tar dyes. Another product of industrial research that is of great industrial value is synthetic ammonia.

During the war industrial research received a great impetus in nearly all the belligerent countries, in connection with aircraft development, substitution of materials that were plentiful for those in which there was a scarcity, and with munitions of all kinds. During that period the Government-controlled laboratories added rapidly to their equipment and personnel. The results achieved further emphasized the value of industrial research, and as a consequence the British Government shortly after the conclusion of hostilities desired to extend Government aid for such research. A Department of Scientific and Industrial Research was established and branches of industry were encouraged to form research associations to which Government funds would be allocated in proportion to the funds raised by membership dues or contributions.

Many research associations were formed under this plan, one in the motor car industry, and brief reports are made public from time to time, outlining the subjects under investigation. The actual results of the work, of course, are disclosed to the members only. Lately there has been complaint that the results in some cases have not been up to expectations, and the reason given is lack of proper personnel. Such a thing might almost have been expected, when it is considered that the number of men with the proper mentality for such work is limited, and so many industries in Great Britain took up research work at practically the same time.

While probably not as rare as promising material for grand opera singers, persons with the proper qualifications to act as industrial research workers are certainly not numerous. They must have a penetrating mind, and a good training, and they must be willing to work persistently and industriously toward results that can be applied commercially. They do not see dangling in front of them the rich rewards which the average professional inventor always imagines to be in store for him, and they have little prospect of the glory that comes to the successful artist and litterateur. Yet, in order that their work may be successful they must have exceptional qualities of mind.

A Paying Proposition

That industrial research pays, especially in the case of large organizations whose volume of business enables them to maintain large, well-equipped and well-manned laboratories, is fully recognized today, and all of our large industrial organizations, including General Electric, Westinghouse, General Motors, duPont de Nemours, Eastman Kodak, and many others, maintain research laboratories. The smaller concerns do research work on a more modest scale. Research work, of course, merges into industrial development work, and there is hardly a concern that manufactures motor vehicles (as distinct from assembling) that does not do some research work. It may not have a regularly organized research department going by that name, but it will constantly meet with problems that require research, and if a department to which such problems can be assigned is lacking, then the chief engineer, experimental engineer or metallurgist must take off enough time from his regular duties to work them out.

Just Among Ourselves

Do They Burn Second-Hand Pianos?

THE piano industry always has been a favorite example for use by automotive economists when looking for some other industry to compare with the automobile. Despite that fact, our personal knowledge of practices in that industry has been pretty meager. We've heard it said, for example, that the piano people had materially lessened their trade-in problem by artificial scrapping, taking the form of huge public bonfires of obsolete equipment on several occasions. It never sounded quite reasonable to us, but with normal human slothfulness we didn't investigate. Lately, however, the following paragraphs from a letter written by B. B. Wilson, editor, *The Music Trade Review*, have come to our attention and we think them worth reprinting:

* * *

Frequently the Pianos "Burn" the Dealers

THE question of trade-ins of pianos," Mr. Wilson writes, "has been receiving the attention of the piano industry for a number of years, and they are apparently as far from a proper solution as ever Some 15 years ago a few old squares were burned at Atlantic City while a convention was in town and that is the only case I know of where such a course was resorted to. In certain instances, where a piano is so old and decrepit that it does not warrant costs of repairs, the dealer will salvage such parts as may be used for other purposes and use the case for firewood. Whatever the dealer loses on a trade-in whether he sells the old piano for less than the allowance or destroys it, must be borne by the dealer himself." All of which indicates the experience

of the piano industry probably won't be the Moses to lead the automotive used car out of its wilderness.

* * *

Applause for Edison From Another Source

LAST week we voiced our admiration for the way in which Thomas Edison answered the multitude of questions put to him on his eightieth birthday. Two days following the writing of that item we were delighted to have our opinions confirmed by F. P. A., the well-known columnist of the *New York World*. Says Mr. Adams: "The octogenarian interview usually is bunk. Old gentlemen give advice and indulge in a lot of belated guessing. Mr. Thomas A. Edison's answers to the questionnaire submitted to him on his eightieth birthday were the freshest, candidest, bunklessest we remember to have seen. When Mr. Edison, through ignorance, lack of interest, or insufficient deliberation didn't know, he said so." Well, we always did think F. P. A. knew his banana oil!

* * *

Argument Over Reward for French Flyers

THERE was much justified jubilation in Paris last month when two French naval officers, Bernard and Bougault, completed an airplane flight to Madagascar and back.

Realizing that their respective businesses would greatly benefit by the exploit, the manufacturer of the plane in which the trip was made, and the manufacturer of the engine with which it was equipped, each offered the aviators a check for 50,000 francs, as a token of their appreciation. Bernard and Bougault, however, refused to accept these checks, stating in explanation

that the flight was made as part of their regular military duties and that they could not accept emoluments from civilians. In French aircraft circles it is believed that the etiquette to be observed on such occasions was outlined to the young officers by "higher-ups," and a controversy has arisen over the subject. One of the French aircraft papers holds that if Bernard and Bougault had no right to accept the 50,000 francs of the aircraft manufacturers, M. Briand had no right to accept the Nobel peace prize, which was recently awarded him and which carried with it a considerable sum in shining Swedish crowns. The paper states the Nobel prize was awarded M. Briand for his work on behalf of the maintenance of peace, but that as Secretary of State efforts to maintain the peace were directly in his line of duty.

* * *

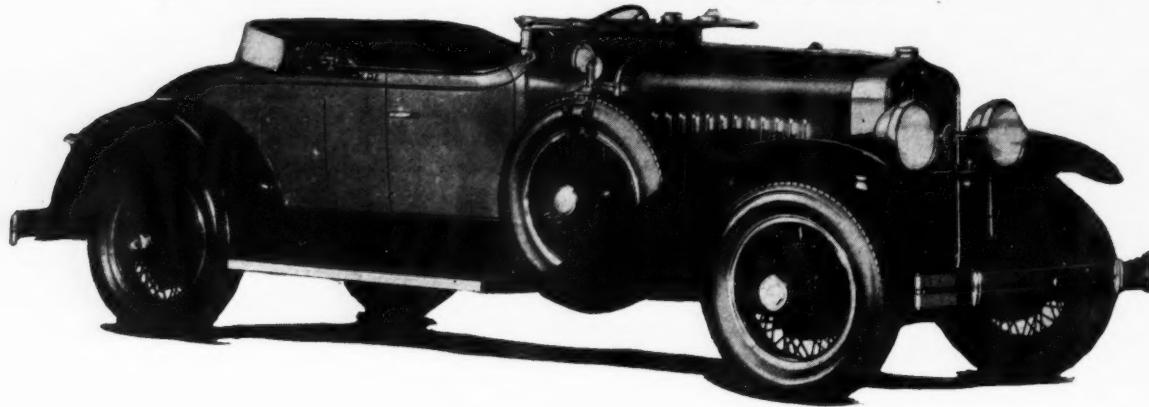
Where Ford Got His Air Tour Idea

WHILE we're talking about aviation we want to rise up and with a loud voice give credit where credit is due. Seems as though our recent article about Ford's air activities gave entire credit to Ford for the idea of having an airplane reliability tour. The S. A. E., as a matter of fact, was responsible for originating the idea which was conveyed personally by Coker Clarkson to Henry Ford. Ford accepted the idea with alacrity and carried out the tours largely in his own way, but a history of the tours certainly isn't complete without mention of the vital part played by the S.A.E. in their conception. The tours have been such a success that there is plenty of credit in them for every one to have his share.—

N. G. S.



At the left is the emblem which has been chosen for the new LaSalle. The crest of Sieur de LaSalle, noted French missionary and explorer, is incorporated in the design. Below—The two-passenger roadster with rumble seat which lists at \$2525



General Motors Announces

The *LaSalle*, a New

Car will fill price gap between Buick and Cadillac and will be built in latter's plant. Engine has 303 cu. in. displacement and develops 75 hp. Bodies are distinctive.

By W. L. Carver

A NEW name appears in the automotive firmament this week with the announcement by General Motors of the LaSalle, a \$2500 V-eight which is to be manufactured in the Cadillac plant and marketed by the Cadillac organization.

The new car is designed to fill the price gap which has existed heretofore in the General Motors line between the Cadillac and the Buick. While it will be built and marketed by the Cadillac organization and its mechanism possesses many points of resemblance to that of the Cadillac car, it will be handled as a distinct product rather than as a smaller edition of that well-known make. In the announcement of the company it is stated that four years of development work were spent on the new model, which has a wheelbase of 125 in., and is therefore 7 in. shorter than the short wheelbase Cadillac.

As might be expected of a car developed by the Cadillac engineers, the engine is of the eight-cylinder V-type. Its bore of 3 1/8 in. and stroke of 4 15/16 in. give it a displacement of 303 cu. in., and it is claimed to develop 75 hp. at a very moderate speed. A top road speed of more than 70 m.p.h. is claimed, with commensurate acceleration and hill-climbing power. The

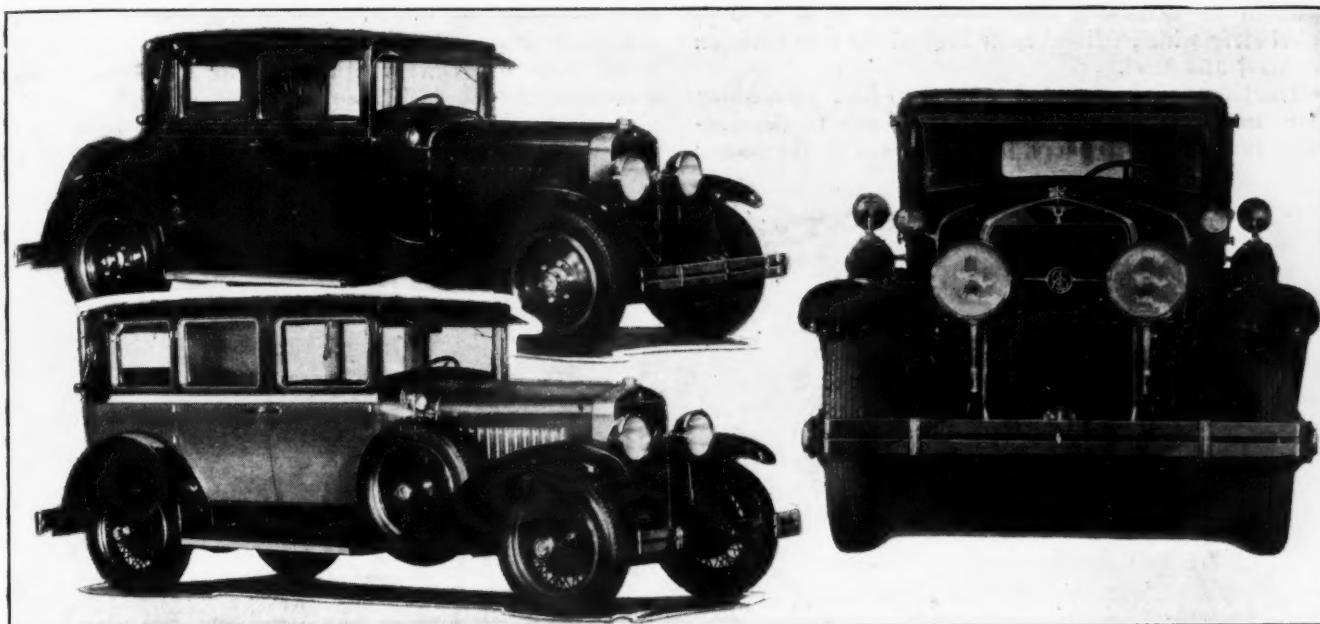
height of the frame from the ground is 20 in., and although liberal head room is provided, the roof line of all models is about level with the eyes of a person of average height when the car is at the curb.

Aside from a number of new mechanical features, the LaSalle introduces a new two-tone color scheme by which surfaces viewed from any direction are broken up, giving the impression of unusual compactness. Hoods and cowls are finished in a darker tone than the bodies proper, where the effect is continued by cheat lines at the bottom, by the pillar lines, and by unusual belt molding effects.

Six body models with prices closely grouped about midway between \$2000 and \$3000 comprise the new line. These with corresponding prices are listed below:

Two-passenger roadster with rumble seat	\$2525
Five-passenger phaeton	2495
Two-passenger coupe with rumble seat	2585
Two-passenger convertible coupe with rumble seat	2635
Four-passenger victoria	2635
Five-passenger sedan	2685

Particular attention has been paid to the design and appointments of the open bodies, as it is believed that



Upper left—LaSalle four-passenger victoria. Lower left—The four-door sedan. Right—An interesting front view of the LaSalle, showing the radiator design, the monogram which is an integral part of the lamp connecting bar, and the creases, or windbreaks, on the fenders and radiator cap

\$2500 V-Eight *in Six Body Styles*

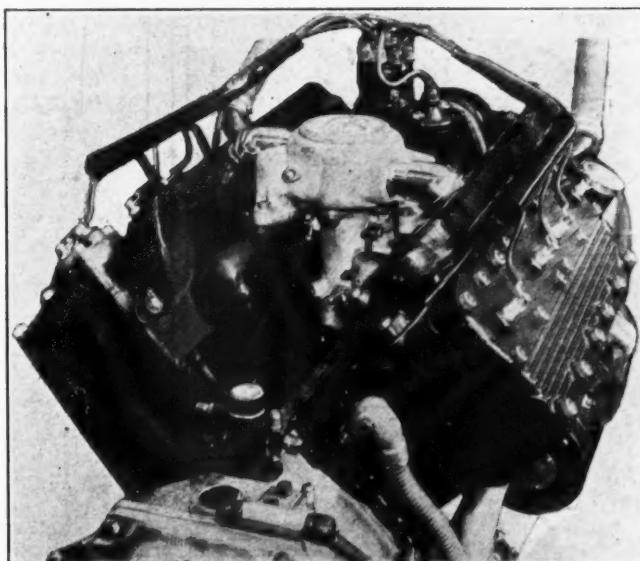
the market for open cars of distinctive appearance will be a strong factor in this year's quota.

Windshields are arranged to fold flat with the top of a wide polished aluminum base which extends clear across the body. Tops also are arranged to fold flat and are equipped with wood bows and polished nickel fittings. While 12-spoke artillery wheels are standard for both open and closed models, disk wheels are optional. Present production plans also call for the equipment of about 30 per cent of the cars with wire wheels and in this case two spares are mounted in wells in the front fenders while a folding rack is substituted for the usual tire carrier. Front and rear bumpers are standard on all models.

Fisher bodies are used throughout, and V-V windshields are fitted to all closed bodies with the exception of the convertible coupe, which has a tilting windshield equipped with adjustable nickelized fittings. Closed bodies are trimmed inside in mohair and carry complete equipment suitable for each body type. Typical items are dome lamps, leather-covered

vanity case, smoking set, foot rest, assist cord, robe rail, arm rests and remote door controls. All interior metal is in Butler silver finish. In addition to the rumble seat for the coupes and roadster, golf bag compartments are included.

Individual exterior appearance is emphasized by a bead or windbreak effect which is worked into the tips of the fenders and on the backs of the bullet type nickelized head and cowl lamps. A similar effect is continued at the top face of the radiator shell and carries over the top of the low filler cap and along the top of the hood. The radiator is high and deep and relatively narrow, with slightly sloping top surfaces. A winged emblem bearing the crest of Sieur de LaSalle is mounted in the triangular panel at the top front surface. The appearance of depth is amplified by continuing the black enamel appearance of the thermostatic shutters over a great part of the bottom tank of the radiator. High lateral surfaces of the hood panels are broken up by several pronounced louvres in the vertical direction. Cowl lamps are

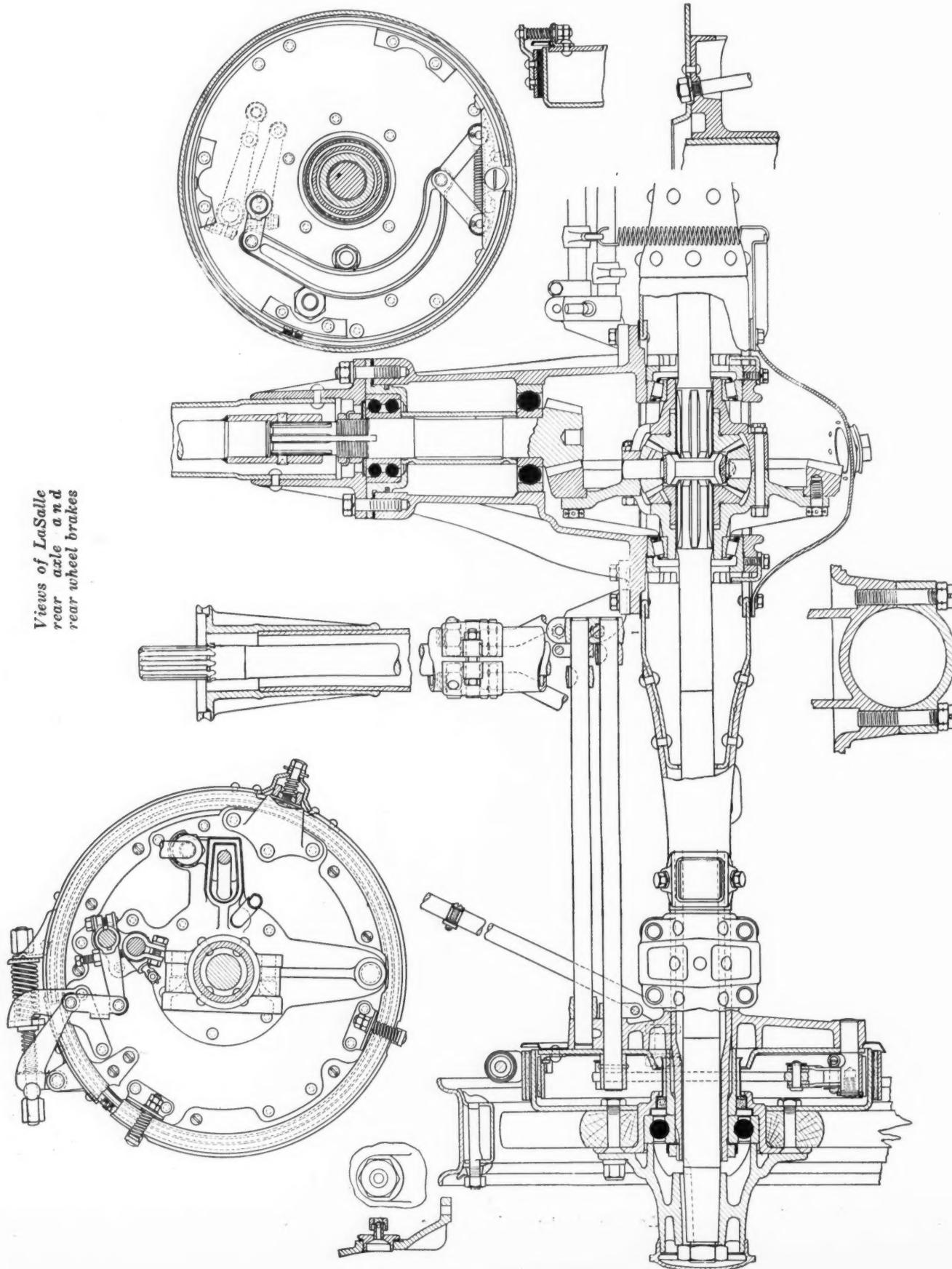


The LaSalle eight-cylinder V-type engine. A feature is the wide use that is made of aluminum alloy in its construction

mounted on extension arms projecting from a wide nickel strip which follows clear around the line between the hood and cowl.

Headlamps are mounted on individual stanchions while the cross brace, which also extends to the one-piece, full-crowned fenders, is interrupted at the center

by a LaSalle monogram. At the rear is mounted a combined stop and tail lamp. Both open bodies are fitted with two cowl ventilators which are arranged symmetrically at each side of a conservative arrowhead panel which begins at the top of the hood and blends into the windshield base and belt molding. Three



standard color schemes, including two-tone uses of shades of red, blue and green, are optional. The darkest shade is applied to the hood and cowl and extends along the cheat line at the bottom of the body. A dark effect which blends with the Fabrikoid top is used at the pillars, while reveals of light shades surround all windows.

Metal Instrument Boards

Metal instrument boards are set off by walnut panels while all instruments are grouped at the center in a die-cast aluminum panel equipped with two indirect lights. Included are the usual speedometer, clock, oil pressure gage, gasoline gage and a remote engine thermometer. This panel also mounts the carburetor starting control button, which is located symmetrically with a similar button for the ignition switch. Locks are fitted in the doors and in the gearbox. Supplementary manual control for the automatically controlled distributor head is by a decorative lever which is mounted on the instrument board immediately ahead of the steering column. At the opposite side of the board is an electric cigar lighter.

Another unusual feature is the steering wheel, which comprises a cast-aluminum spider with a steel-reinforced molded rubber rim of relatively small diameter. This rubber rim is slightly resilient and is used to reduce road shocks to the last degree. Handling is facilitated by small ridges molded in the rubber. All lights, including the twin beam arrangement and auxiliary parking lamps in the headlights, are controlled by a lever located below the horn button at the head of the steering column. A smaller lever above the horn button provides manual throttle control. Rear view mirror and automatic windshield wiper are standard in all models.

Tires are 32 x 6 in. on a 20 in. base. Semi-elliptic springs are used all around and Watson Stabilators are standard equipment. All springs are 2 in. wide; the front springs are 39 in. long and the rear 58 in. While the front spring suspension is conventional, the rear employs the tension shackles which are characteristic Cadillac practice. As the torque and propulsion are taken through a torque tube equipped with a ball joint, the rear springs are shackled at both ends. Pin type shackles are used at the front of these springs while at the rear a hardened ball forms the joint between the shackle and the frame.

With the exception of the torque tube arrangement at the rear, axle and brake practice follows present Cadillac practice very closely. The rear axle is three-quarter floating in a built-up steel banjo housing. Ball bearings, including a two-row bearing carrying the thrust, are used on the pinion shaft, while the differential is mounted in taper roller bearings. The standard gear ratio for the spiral bevel driving gears is 4.54 to 1. Ball bearings also are fitted at the axle ends.

Aside from a reduction of diameter to 14 in., the brakes are typically Cadillac. At the rear, equalized contracting bands are foot operated, while internal shoes actuated by an entirely separate system form the emergency brakes. Braking force is equalized between the front and rear. Front brakes

are of the toggle-operated internal band type which are equalized for straightaway operation but compensated for turns.

Although the I-beam front axle has a deep drop, the ground clearance, which is minimum at this point, is 8 3/4 in. Reversed Elliott construction is used at the axle ends with the king pins slightly inclined and equipped with ball thrust bearings. The front wheels are mounted on ball bearings. A worm and sector steering gear is fitted, with a ratio of 17.5 to 1, and the turning radius is 20 ft.

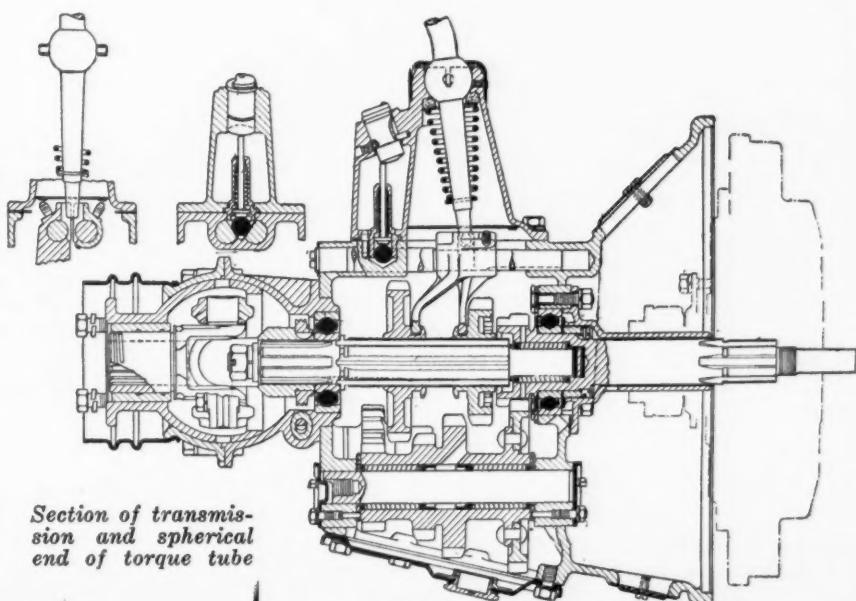
An offset type of frame, which is 29 in. wide at the front and 37 1/2 in. at the rear, is 6 1/2 in. deep at the middle section and tapers toward both ends. Wide flanges are used and the frame stock is 5/32 in. thick. An unusual feature is the reinforcement of 1/8 in. thickness which is incorporated in the front end of each side channel. It is stated that this reinforcement is an important factor in the elimination of shimmy.

Seven cross members tie the two side channels together. A tubular member is fitted at each end of the frame. An intermediate inverted channel is located just back of the gear box and another is placed at the front anchorage of the rear springs. A formed channel is located under the radiator and supports that member and the front ball mounting of the engine. Another channel is placed at the back end of the body adjacent to the 20-gal. fuel tank. The seventh cross member is formed by the bell housing feet at the rear of the engine. All channel cross members are gusseted for additional rigidity. The body is secured to formed steel brackets which are riveted to the webs of the side channels.

Offset Cylinders

While the engine has all the earmarks of Cadillac design, close inspection reveals several important deviations from the larger unit. These latter include offset cylinders, location of the starting motor on the lower back of the bell housing, different manifolding, installation of a new vacuum booster pump in the fuel system and slightly different head construction. Characteristic details which are retained are the four-throw, three-bearing compensated crankshaft, crankcase ventilating system, two-chain arrangement at the front of the engine and belt-driven fan. A striking feature of the new engine is the wide use of aluminum alloy.

The right block is set 1 3/8 in. ahead of the left and



the two connecting rods are placed on the crankpin side by side. Assigning odd cylinder numbers to the right side of the engine and even to the left, the firing order is 1-2-7-8-4-5-6-3.

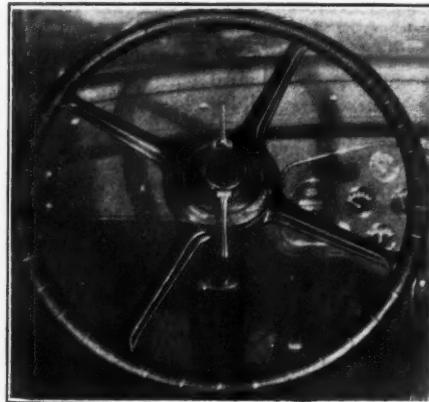
All crankshaft bearings are 2 3/8 in. diameter. Chadwick interchangeable bronze-back, babbitt-lined split bushings are used and are held in forged copper-aluminum alloy caps. Bearing lengths are 1 15/16 in., 1 1/8 in. and 2 1/8 in. and the thrust is taken on the rear bearing. As the cast-in lower rod bearings are 1 3/8 in. wide and arranged side by side, the length of the connecting rod bearing on the crankshaft is 2 3/4 in. The design of the shaft follows Cadillac practice very closely. The crankpins are drilled out to 1 1/4 in. for lightness. Turned copper-aluminum shells, which incorporate the oil passages, are inserted in these holes to complete the assembly, being bolted in place. Counterweights are bolted on.

Connecting rods are 10 in. long between centers and carry burnished piston pins of 3/4 in. diameter in bronze bushings at the upper ends. The heads of the rod are turned and the faces of the shank are ground to equalize weight distribution. Light-weight, full-skirt, nickel-iron pistons carry three rings above the pin, the lower being a double-slotted scraper type in a drilled groove. The detachable cylinder head incorporates the combustion spaces which are designed for high compression and high turbulence. An unusual feature is the use of several small longitudinal cooling fins on the top of each cylinder head casting.

Silent Chain Camshaft Drive

The camshaft is mounted directly over the crankshaft in four bearings. Three of these are inserted bronze bushings while the front bearing is a bolted-in copper aluminum casting which carries the end thrust. Sixteen cams provide individual operation for each valve. Camshaft drive is by a heavy silent chain from the forward one of two sprockets on the crankshaft. An unusually heavy chain is used and no adjustment is provided in the camshaft drive. At the front the camshaft carries a large pressed-steel pulley which drives the six-bladed 20-in. automotive fan through a V-belt. This fan, which includes a plain cast-iron bearing running on a hard shaft with high pressure lubrication by a built-in gear pump, is mounted in a slotted bracket arrangement which provides adjustment for belt wear.

Roller type lifters are grouped in assemblies of four in copper-aluminum brackets which bolt to the surfaces to which the cylinders are bolted. The barrel portion of the lifters is of light tubular section and the rolls are aligned by projections which engage



An unusual feature of the La-Salle is the steering wheel, which has a slightly resilient rim of steel-reinforced molded rubber. It is said to absorb road shocks

with slots near the top of the bracket.

Valves have a clear opening of 1 1/2 in. Tungsten and silica-chrome steels are used for the intake and exhaust valves respectively. Intake ports are sintered while the exhaust ports are individual. Separate intake and exhaust manifolds are used, a header at the front connecting both exhaust manifolds to the exhaust pipe. A cross manifold which joins the two longitudinal intake manifolds incorporates an exhaust-heated chamber. This chamber is connected by slip joints to both exhaust manifolds. The design is claimed to be such that a relatively greater heating effect is produced at low speeds. The vertical carburetor is very similar to that used on the Cadillac and incorporates thermostatic elements which proportion the mixture according to temperature and tend to reduce the need for the use of the choke. The capacity of the gasoline tank is 20 gal.

Vacuum Booster Fuel Pump

While fuel is fed from a vacuum tank and gas-colator on the dash, a vacuum booster pump in the V near the back of the crankcase assures adequate fuel flow at full throttle opening. This pump is driven by a small eccentric strap from the camshaft. The pump is shunted across the line connecting the intake manifold and the top of the vacuum tank. A one-way check valve is placed in the primary or usual line so that the vacuum pump cannot draw from the intake manifold but merely reduces the operating pressure in the vacuum tank to the desired degree during full throttle operation.

The air discharge side of the pump, which relieves the load on this unit during part-throttle operation, is connected to the interior of the crankcase.

The regular Cadillac crankcase ventilating system is included in the new design. Holes which communicate with the valve housing chamber are drilled through the cylinder walls and one end of the valve housing chamber is connected with a flexible hose which carries the exhausted vapors down under the car. Pressure for this exhausting operation is created by the impeller action of the crankshaft in conjunction with the arrangement of the breather.

A separate silent chain driven from the rear one of the two sprockets and extending horizontally to the right provides the drive for the generator and water pump. The latter unit is located on the front of an aluminum housing and driven through a flexible coupling from the generator drive sprocket. Both water pump and generator are locked together by a strap which permits them to be swung simultaneously for chain adjustment. The generator is of the Remy-Delco two-pole type, with third brush regulation.

A vertical shaft driven by helical gears located near the front of the camshaft, drives the distributor. This unit, made by Delco, is mounted on a bracket which extends well up the V formed by the cylinder blocks. Two breaker arms and a four-lobed cam are used. The Delco coil is attached to the distributor bracket and the high tension leads to the spark plugs are inclosed in polished tubing.

Copper-aluminum alloy again is used for the oil pump housing. This unit, of the gear type, is bolted to the lower side of the front main bearing cap and driven by a vertical shaft which connects with the distributor shaft. A copper tube manifold connects the pump to the intermediate and rear main bearings, while connection to the front bearing is established at the

(Continued on page 371)

Used Car Situation May Affect New Car Production

Many dealers sacrificing sales which involve trade-ins at poor bargains. Higher profit margin per unit is necessary to maintain factory equilibrium if output is curtailed.

By Norman G. Shidle

ONCE the industry was prone to approach its merchandising problem something like this:

New cars must be sold. Trades and used cars, therefore, must be handled in such a way as to promote maximum new car sales.

From now on the tune is going to be changed. It will run, instead:

Used cars must be bought for less than they can be sold for.

The efforts of dealers to thin out their used car stocks and their determination to accept trade-ins hereafter only on such terms as will enable them to resell at a profit, may act as a temporary check on new car sales in some cases



Used cars must be sold. New car production, therefore, must be handled in such a way as to permit this used car action on the part of dealers.

It takes some time for a cycle of this kind to work out. Dealers today are finding it possible to move as many used cars per week as they did a year ago only by selling them at considerably decreased prices. This in turn is affecting their appraisals of used cars offered to them in trade.

Eventually a new balance will be achieved with the flow of used cars to and from the public fairly well synchronized and dealer used car stocks at low rather than usually high levels.

In the meantime, slightly curtailed output of new cars may be necessary to hasten the better conditions which undoubtedly lie beyond. For that reason, many manufacturing executives today are figuring unit profit on a somewhat different basis than they were a few years ago. Many of them are hoping, despite competitive conditions, that they will be able to maintain present car prices indefinitely and increase their profit margin per unit by pocketing a major portion of the production economies achieved in 1927 instead of passing them along to the public in a vain effort to get a permanent lead on a competitor.

The present state of the used car situation throughout the country bears clear evidence of the coming of a transition period and of the vital character of the used car in 1927 profit and production calculations.

The relatively heavy stocks of used cars which dealers are carrying and the relatively slow rate of used car sales in many sections of the country are beginning to have a very definite reflection on the net profit per unit of car manufacturers, while indirectly they are affecting the profit and loss statements of parts and accessory makers, raw material suppliers and every other element of the automotive industry. For a long time, the adverse reaction of used car conditions on dealer and distributor profits has been fully recognized. But every part of the industry bids fair to bear some share of this burden in 1927.

Here's how it has worked:

Strenuous effort on the part of manufacturers to keep up production schedules in years gone by resulted in dealers allowing for used cars on trade-ins considerably more than they were able to get when they tried to resell those same cars. Dealers' profits began to decline.

Then the dealers were told to "Buy them right."

With the factory urging upon them a steady stream of new cars, that admonition wasn't so easy to follow. Moreover, the real value of a used car wasn't so easy to determine even with the most careful appraisal. Dealers began to learn that the mechanical condition of the car was only one part of the question—and sometimes a very minor part. The vehicle might be in excellent condition mechanically without being a readily marketable product. They began to find out that used car value depends primarily on supply and demand and relatively little on the mechanical condition of the vehicle.

Nevertheless, they continued to hear that generality, "Buy them right," dinned into their ears. And finally economic pressure, along with the repetition of the slogan, began to force them to heed the admonition as best they could.

Right this minute there are thousands of automobile dealers all over the country who are doing their damndest to "Buy them right." They are offering prospects less money on used cars proffered in trade than ever before; they are refusing through over-allowances to bear part of the burden of the owner's operating cost as they have done in the past.

The result is that in many cases owners are deciding to "run the old bus another year."

That's one of the reasons that new car sales may not be so large this year as they were last. Those companies whose list prices and production facilities are so geared up as to permit only an extremely small profit per unit and who are relying for adequate profits almost wholly on their ability to maintain maximum volume would seem to have some tough sledding ahead. . . .

All because the dealers of the country really are beginning to practice the policy of "Buying them right," which eventually is certain to work out for the best interests of the industry as a whole.

There are many evidences that the automotive industry is in a transition period and that the used car is the pivotal point of the transition. Economically speaking, it has been evident for some years back that the dealers of the country could not go on forever buying used cars for more than they could sell them. The growing number of sales involving trade-ins made more sound practice in that regard increasingly necessary as time went on.

Evil Day Was Postponed

For some years the slack perhaps was taken up through new capital entering the dealer field to take the place of that which used car disasters had eaten up. Thus the trouble didn't wash back to the manufacturer's balance sheet for a good while. But finally it got there, as the supply of new capital eager to be utilized in this way grew slimmer.

The inefficiencies of the dealer have frequently been pointed out as the reason for his financial and used car difficulties and for his inability to handle more new cars. Frequently these criticisms have been entirely justified. But the present trend toward sounder methods on the part of dealers seems to be proving in a somewhat practical way that the basic trouble lies somewhat deeper, probably in the excessive reliance of some car manufacturers on low unit profit and high volume as the sole basis for net profits.

Even if dealers buy used cars right, in other words, new car sales cannot go on with unabated speed unless used car sales proceed at the same rate. Regardless of the efficiency of the individual dealer, the producing company which has so low a unit profit on its products as to stake its all on its ability to keep its plants going

almost at capacity seems likely to be faced with a most difficult problem for the next few years.

When the industry gets through the transition stage into which it now seems to be passing, it is certain to emerge into an era of greater stability, better profits and stronger prosperity than ever before. The dealers of the country have almost reached the stage where sheer force of economic pressure is compelling them either to buy used cars right and keep used car stocks moving or go out of business. The vast majority of them aren't going out of business.

The possibility of maintaining adequate volume and at the same time holding up profit per unit has been demonstrated during the last year or so by the largest corporate interest in the industry—and the stabilizing effect on the whole industry of General Motors' price policies in the last 24 months can scarcely be overestimated.

Six-Wheel Jobs for Desert Service

MANY interesting features of design, which are the result of experience in operating in the intense heat of the Syrian desert, are incorporated in two freight transport vehicles and a bus completed early in February by the Six-Wheel Co., Philadelphia, for the Nairn Transport Co., Beirut, Syria. The vehicles will be used to augment the motor service of the Nairn company on the 700-mile route from Beirut to Bagdad.

Providing efficient engine cooling with air temperatures ranging up to 120 degrees and preventing air from the fan from reaching drivers and passengers were two problems which influenced the design. A slow-speed, 26 in. fan driven by two V-belts cares for air circulation through the radiator. It has proved more effective than a smaller fan driven at higher speed. Hood louvres are punched inward, instead of outward, to increase the discharge of air from the fan at this point. A sheet metal chute, which replaces part of the footboard, provides an adequate exit for the remainder of the air.

Chassis of the three vehicles are alike, being modifications of the Six-Wheel Safeway bus chassis. A Continental 15H six-cylinder engine with two spark plugs per cylinder is used. Independent ignition is provided by a Scintilla magneto and North East battery distributor system. Transmission is a Brown-Lipe two-range. Rear axles of Timken manufacture are reversed and the propeller shaft mounted above the frame, instead of running through the X-shaped cross member system. North East starter and generator are used. Westinghouse air springs are used on the front springs while the double rear axle assembly has four Lovejoy shock absorbers. Tires are Goodyear balloons 40 x 10.50 in. A chassis lubricating system, fed by a one-gallon oil tank is used. B-K booster brake mechanism is employed with an unusual hook-up. Brake effort is transmitted forward to a cross shaft and then back to rear wheels.



Six-Wheel truck built for desert service

Heavy Saving Effected by Buick Unified Assembly Line

1300 complete cars turned out by 850 men during nine-hour day in space 64 ft. wide and about 1300 ft. long. 225 tons of material handled per hour. Inventory greatly reduced.

ECONOMY in all its phases, smoothness of operation and speed are the outstanding advantages arising from the new unified assembly line which is in operation at the plant of the Buick Motor Co. in Flint, after a year of development. Although three assembly lines employing 850 men with a maximum production of 1300 complete cars in a nine-hour day are concentrated in a space 64 ft. wide and about 1300 ft. long, the absence of confusion is remarkable.

When it is considered that about 225 tons of material pass through this line every hour, and that nearly 30 different car types involving two sizes of engine, three different lengths of wheelbase and all of the minor variations of the modern automobile market, including right-

hand drive export vehicles, are completely assembled in this department, some idea of the scope of the work is obtained.

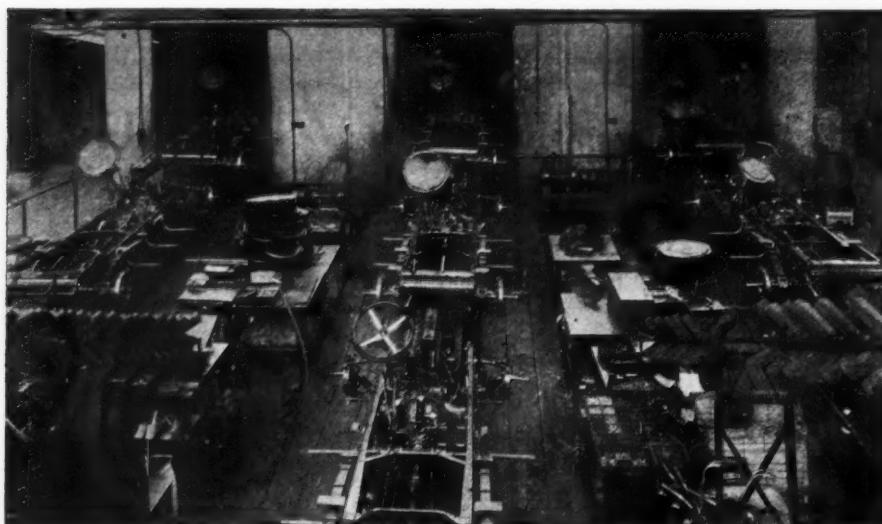
Beginning at the head of the line as a bare frame which is the foundation, the complete vehicle emerges at the lower end, 1½ hr. later without leaving the line at any point. Although each line is in three sections, travel is constant and practically every foot of the distance sees some addition made to the whole.

Ordinarily, the installation of three assembly lines in a space 64 ft. wide presents almost insurmountable difficulties due to the lack of either storage or working space adjacent to the point of application. In this case the problem was solved by bridges or mezzanine floors which

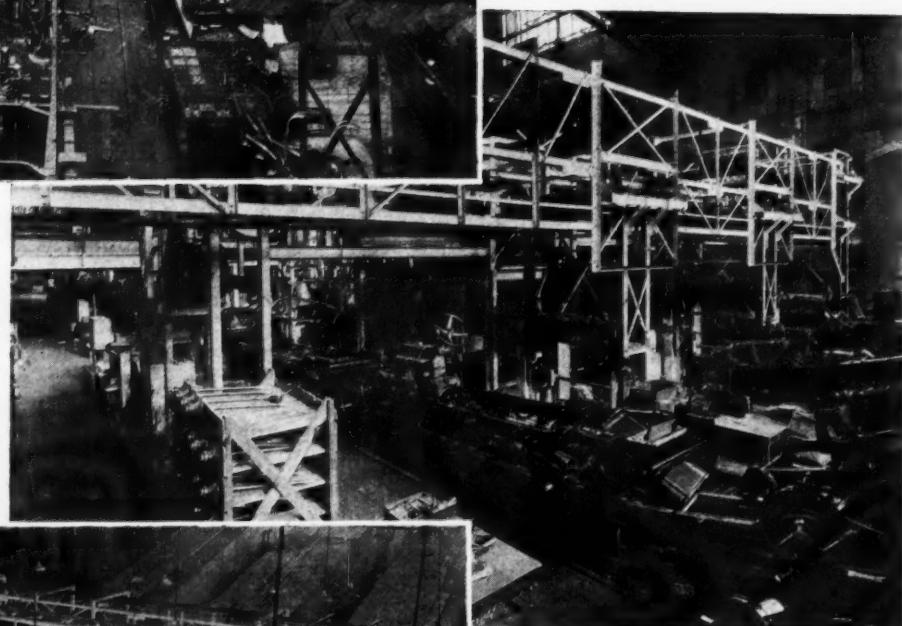
BELow: Fig. 1. Exterior view of Buick "elevated." This conveyor transfers engines from final test room to unified assembly line more than half a mile away. Passes over several buildings, has several curves and grades and requires but ½ hp. for continuous operation

RIGHT: Fig. 2. Interior view of a section of the overhead engine conveyor

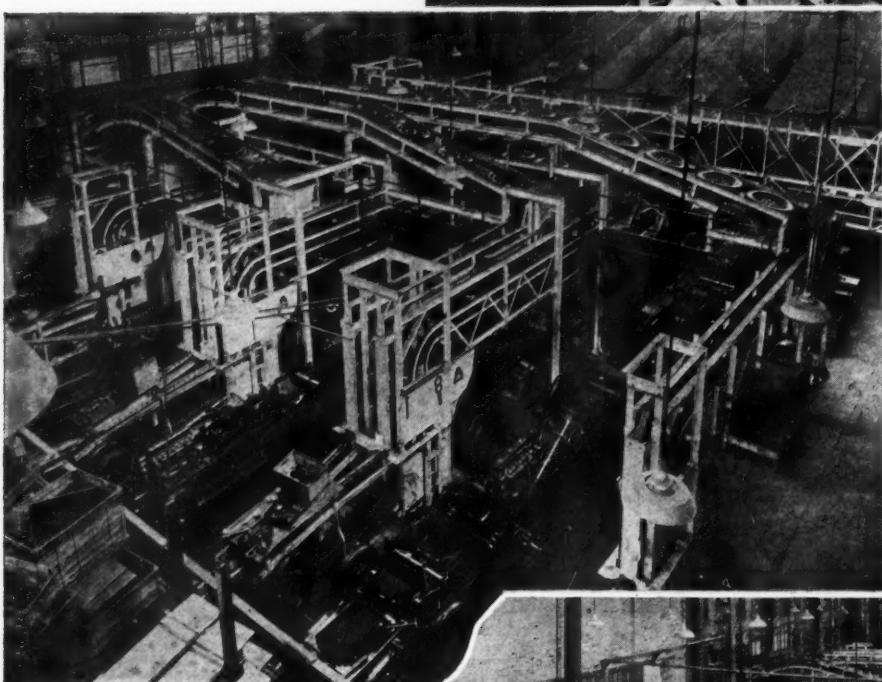




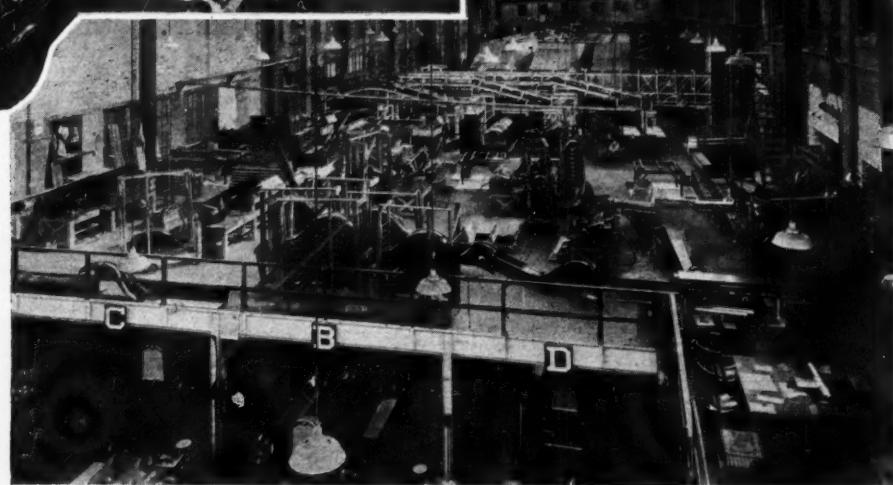
LEFT: Fig. 3. Three lines of chassis leave bridge and pass up incline into cleaning and painting booths and ovens. Note slides for lowering fans from mezzanine floor to assembly lines



RIGHT: Fig. 4. Descending from ovens, lines pass under continuous battery conveyor which brings correct battery for any type of car to line at proper time



LEFT: Fig. 5. Wheel conveyor which is charged in basement room, brings front and rear wheels in correct order for every type of car



RIGHT: Fig. 6. On this mezzanine floor radiators are prepared, also sub-assemblies of front fender, running-board and dust guard are lowered to line. Supply is by power conveyors. Also shows general view of unified assembly line

are placed above the line proper and serve as sub-assembly storage and delivery floors. From these mezzanine floors parts are delivered in exact quantities in time with the movement of the line and at just the right point for easy assembly at any of the three individual lines.

Considering the three lines as trunk lines, these bridges are way stations where miscellaneous freight is sorted and assembled and delivered to the carrier with the least loss of time and confusion. Finished and assembled sub-assemblies from the 16 factories in the Buick group and many outside sources converge at these bridges in such order and timing that the men on the lines always have the piece or assembly for the next car at hand before completing the operation on the preceding car. Outside of cotter pins, nuts, washers, etc., almost no stock is carried on the lines or bridges.

Inventory is Reduced

Reduction of inventory is one of the chief things accomplished by this unified assembly scheme. Already the "float" or stock of parts on hand has been reduced by more than 50 per cent. As a matter of fact, the unified line is to be regarded as the peak of a pyramid of preparation and planning which involves every activity in the plant right back to the purchase and receipt of all materials.

No attempt is made at grouping the day's output of any particular type of body or wheelbase over any one of the three lines. However, the parts for any particular job match up at the various portions of the lines with the precision of clockwork. A master schedule which is completed 12 hours in advance of operations on the line is the secret to its perfect operation. From this master schedule, individual schedules for the source of each class of material are made and delivered to the correct department. This material then is routed out of that departmental source in the correct order. Material schedules are made up three months in advance from the sales department's figures.

Material handling is another important aspect of the whole scheme of operation and the substitution of carefully-planned power and gravity conveyors has reduced the handling labor charges of the plant by at least 50 per cent. Although the Buick factories are distributed over a wide area, power conveyors are utilized to bring most of the material to the bridges over the assembly line. The outstanding material handling installation is the engine conveyor which is illustrated by Figs. 1 and 2. Engines are delivered to a room adjacent to the proper bridge from the engine test room which is more than a half-mile away. This covered elevated conveyor passes over the roofs of various buildings and makes many turns and has several grades. However, the power requirement for this conveyor, which is said to be the longest in the world, is only 1½ hp.

Four Enameling Ovens

Four continuous conveyor A-type enameling ovens of nearly 800 ft. length constitute another feeder of the unified line. At the unloading ends of these ovens, parts such as fenders, dust guards, etc., are loaded on wheeled racks and then are moved to the correct bridge by continuous chain conveyors of considerable length. This movement is from one building to another via an arched bridge.

According to Cady B. Durham, vice-president of Buick and father of the unified scheme of manufacture, this plan is the differentiation between "hard work" and "working hard." In the first instance, the pulling, hauling and lugging of parts and assemblies which are

transported crudely wear out the individual worker, make him dissatisfied with his job and finally he quits. Then the organization is compelled to train another man into a relatively intricate job and ultimately he gets dissatisfied.

"Working hard" comprehends a plan which brings the job to the individual in a clean-cut way which simplifies the work and schedules it in such quantity and order that he has to stick to his knitting in order to hold his place in the gang. Incidentally, the entire unified assembly department is paid as a whole at a rate based on a fixed price per completed, approved car.

According to Mr. Durham, the unified system of manufacture with the attendant close analysis of every operation and all handling plus the advantages of Duco finish, which have reduced the body "float" from 17 to 3½ days, are largely responsible for Buick's ability to increase production, build more car for the money and make better profits. A master schedule posted in his office demonstrates that estimated and actual production do differ by one car per day occasionally.

An interesting sidelight is that the space now occupied by unified assembly line formerly was a courtyard between two multi-story buildings. A concrete floor was laid and the roof, consisting largely of transverse monitors equipped with ventilating sash, spans the entire 64 ft. with no intermediate supports. By this simple expedient a new building of unusual lighting and ventilation characteristics was produced.

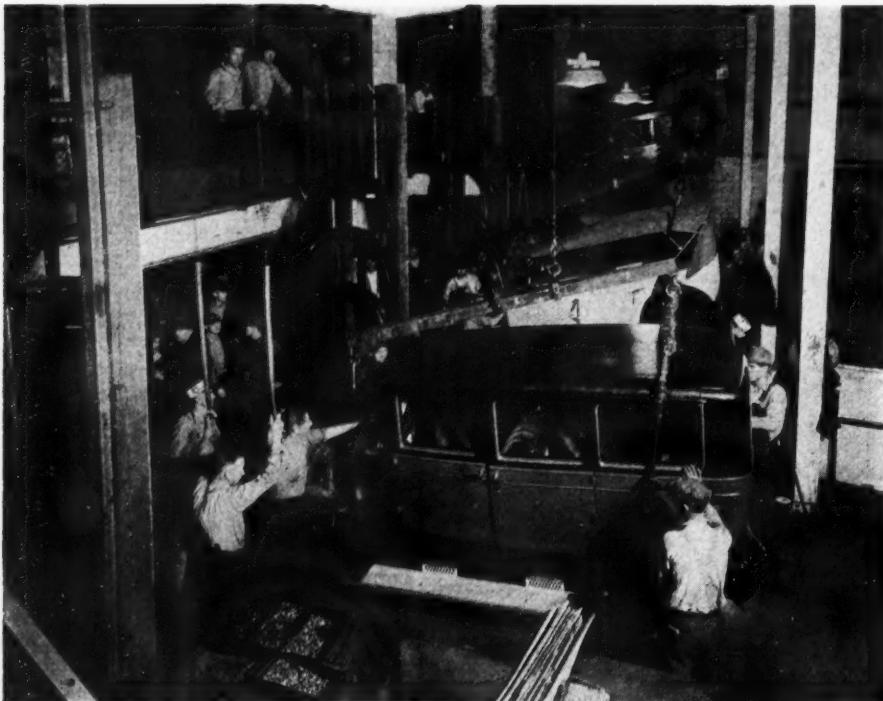
Frames Delivered on Skids

At the head of the department, the three sizes of bare frames are delivered on skids. Then the individual frame is transferred to a castered truck and rolled into one of a group of riveting stations. The frame is loaded upside down so that all brackets can be attached by hot rivets with no further handling. Rivets are heated in brick-inclosed forges which are claimed to permit the fastest operation and are driven and set by air hammers and dollies. (All three of the lines from end to end are identical so that description of one line will apply to all.)

Then the truck bearing the frame is pushed on to the head of the power conveyor line and immediately passes under the first of the bridges or mezzanine floors. On this floor completely assembled and tested axles are received via power conveyors from the axle plants. Also springs are concentrated here. Cantilever rear springs are equipped with the center support bracket and dropped down inclined chutes at each side of the line. Front axles and springs are sub-assembled while the rear axle assembly includes the torque tube. Front and rear assemblies are dropped down through openings in the mezzanine floor by hoists which align them with the chassis moving along the line. In all cases particular attention has been given to the application of speed wrenches, special tools, etc., which facilitate attachment of the specific part or assembly.

As the frame passes out of the space below this bridge it reaches the end of the first section of the conveyor line. At this point an overhead air hoist and trolley are utilized to roll the frame over and drop it on the next section of the conveyor. A chain sling is passed around the middle of the frame, then it is raised and rolled over and finally deposited directly on the rails of the next section of power conveyor.

At succeeding stations, located largely under bridges, a number of incidental assemblies such as that for the brake cross shaft and equalizer are applied. However, only major units will be discussed here. The frame in



ABOVE: Fig. 7. Bodies and chassis join at this point and rear fenders descend from next bridge

normal position now passes under another bridge and at this point receives the complete powerplant assembly, which is delivered from a room at one side of the department. The engine conveyor which supplies this room already has been mentioned. Other conveyors supply the clutch and gear box assemblies. The engines are placed in rows by gasoline propelled lift trucks which are equipped with forks engaging with the skids carrying the engines. Engines are dropped onto these skids at the end of the line already illustrated.

After the powerplant assembly with the exception of the fan is completed, the conveyor trucks deliver them to the cross feeders to the mezzanine floor in accordance with the schedules for each of the three lines. Again a hoist drops the engine down through a well in line with the moving chassis. In this portion of the line the torque tube is connected to the ball joint at the rear end of the gear box.

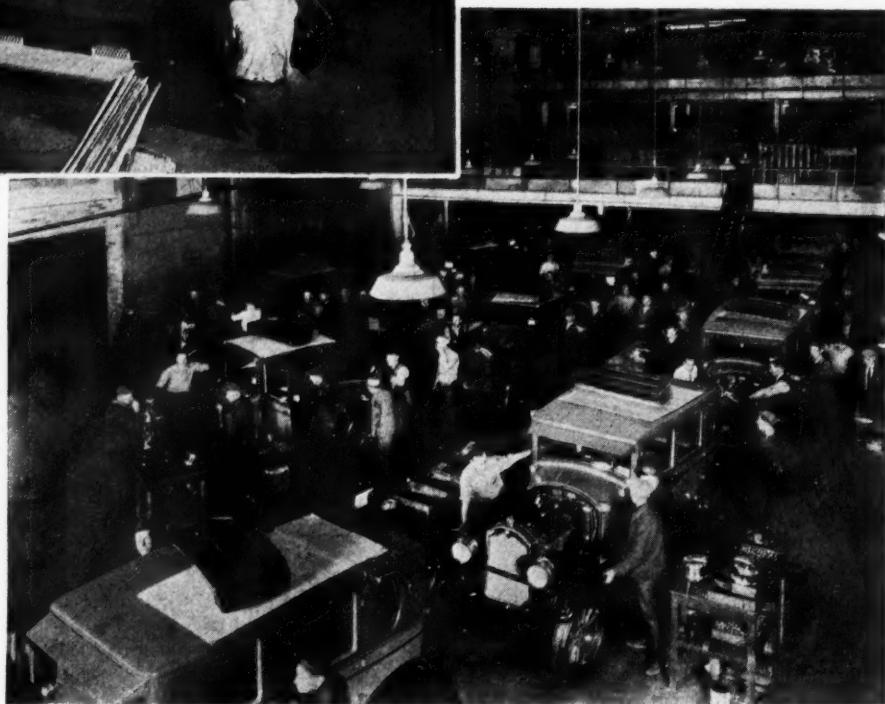
In passing under the next bridge, the steering gear is received, the steering and breaking assemblies on the chassis are completed and the brake bands are rounded. As the chassis passes from under this bridge, it begins to ascend a considerable incline to the cleaning and painting booths. At this point, the fans are applied. This section of the line is shown by Fig. 3 in which the inclined guides for supplying fans from the mezzanine floor will be noted.

Cleaning is done by live steam and next the engine and chassis are enameled, the former in gray and the latter in black. The gasoline tank passes through the enameling process with chassis. Spray guns are used. Next the whole assembly passes through a

hump oven and descends as shown by Fig. 4. At this point live rear axles are deposited on the chassis and batteries are installed. Details of the method of handling and delivering batteries to the three lines are shown by the illustration.

In the next major stage, wheels with complete tire assembly are installed. The conveying means for this purpose are shown by Fig. 5. Tires, tubes, rims and brake drums are brought together

BELow: Fig. 8. End of line from which cars are driven away under their own power



in a basement room which is below the engine supply room. Here again the value of the schedule is shown. At the line, front and rear wheels are delivered to each side with absolute precision for the various types which are in process.

At the next bridge which is shown by Fig. 6, front fenders, dust guards and running boards are made into sub-assemblies and passed down inclined chutes at each side of the line. Radiators also are delivered at this bridge. This view also portrays the general characteristics of the department up to this point. After leaving this station, the chassis leaves the second section of the conveyor and rolls down a slight incline to the point of body application where it is stopped in the correct position by the four-wheel brakes. From this point onward the car moves on its own wheels.

Almost simultaneously with the arrival of the chassis, the body descends through a well from a very high bridge which communicates with the body wiring department as shown by Fig. 7. At the somewhat lower bridge which is next, the rear fenders descend and the car finally passes out into the clear where headlamps are fitted as shown in Fig. 8. Here the vacuum tank is filled after the radiator has been supplied.

Diaphragm Pump Utilized in New AC Fuel Supply System

Operates through lever from push rods, tappets or eccentrics located either on camshaft or any other revolving shaft. Fuel drawn through strainer before being forced into carburetor.

A NEW fuel supply system introduced by the AC Spark Plug Co., Flint, Mich., comprises a diaphragm pump which is operated through a lever from push rods, tappets or eccentrics located either on the camshaft or any other revolving shaft. The pump, which is 4 in. wide by 5 in. high, sucks the fuel from the tank at the rear of the car through a combined gasoline strainer before forcing it into the carburetor.

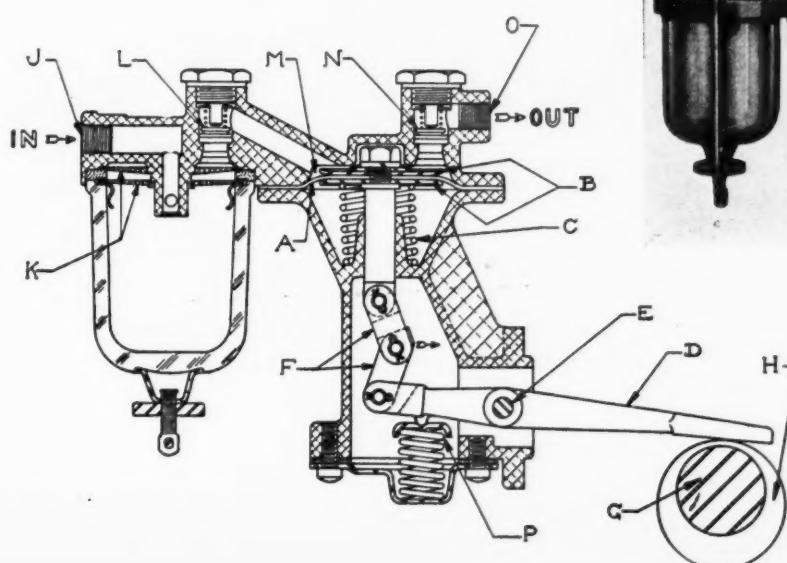
In the design of this unit every effort was made to insure reliable operation and long life. The diaphragm and valves are made of non-metallic materials; as any water contained is separated from the gasoline by the strainer, there is no danger of sticking and freezing of the valves, and, although the pump has a capacity of from twice to three times the maximum requirements of the largest vehicles, it always delivers fuel in accordance with the needs of the engine. All of the working parts of the pump are inclosed in a die-cast housing, and the drive is obtained from any convenient part of the engine which provides a reciprocating motion of from $\frac{3}{16}$ to $\frac{1}{4}$ in.

Referring to Fig. 1, the diaphragm A is made of specially treated cloth which is said to be unaffected by gasoline and benzine or benzol. It is held together by two metal disks and is forced upward by the pump spring C. When it is all the way up the diaphragm almost fills the pump chamber M, and then, when it begins to move down, it creates a high vacuum, which assures operation even at low speeds. It is claimed that a $\frac{1}{4}$ in. motion of the diaphragm can be maintained

indefinitely without injury, because of the extreme flexibility of the material. The diaphragm moves the full distance only when the carburetor float chamber is empty. At all other times the motion is greatly reduced, being always directly proportional to the fuel consumption of the engine, and under ordinary driving conditions the pulsating motion amounts to only about 0.003 in. When the diaphragm is in the depressed position, due to there being sufficient fuel in the carburetor float chamber, the reciprocating motion of lever D will merely cause linkage F to move to the right, as indicated by the arrow.

The complete cycle of operation is as follows: Eccentric H on shaft G lifts rocker arm D, which is pivoted at E and which pulls linkage F, together with diaphragm A, down against the pressure of spring C, thus creating a vacuum in the pump chamber M. Fuel from the rear tank enters chamber M at J through strainer E and suction valve L. On the return stroke the pressure of spring C pushes diaphragm A up, thereby forcing fuel from chamber M through the pressure valve N and opening O into the float chamber of the carburetor.

When the carburetor bowl is filled the float will shut off the inlet valve, thus creating a pressure in pump chamber M. This pressure will force diaphragm A down against spring pressure C and it remains in the downward position until the carburetor requires more fuel and the needle valve opens. Spring P serves to keep operating lever D in contact with eccentric H, to eliminate noise.



LEFT: Fig. 1. Sectional view of AC fuel pump and strainer. ABOVE: AC fuel pump with strainer attached

Torsional Crankshaft Vibration Seen Through Stroborama

Invention of French engineers allows degree of torsion to be read while engine is in motion. Device makes possible more accurate examination of all moving parts.

By W. F. Bradley

USE is being made in a certain number of Continental automotive works of the Stroborama invented by Laurent and Augustin Seguin, French engineers best known abroad by reason of their invention, in the early days of the flying movement, of the Gnome rotary air-cooled engine.

The practical advantage of the Stroborama over earlier stroboscopic methods is that, instead of being a laboratory instrument, it is intended to be employed in the factory, without changing the normal daylight or artificial system of lighting, and it allows the moving parts under observation to be examined with a much greater degree of accuracy than has been possible hitherto.

The automotive factories at present using the Seguin Stroborama comprise Citroen, Lorraine-Dietrich, Chenard-Walcker, Michelin Tire Co., R. B. Magneto Co., the Hobson Co. of Brussels and also the French Government artillery and aviation departments.

This method of direct observation of moving parts, by reducing them to apparent immobility, is particularly valuable in the case of automobile and aviation engines.

Some of the most obvious applications of the Stroborama are the observation of the movement of cams and valves, the detection of the "floating" of valves, a study of the vibration of valve springs, etc. Torsional vibration of the crankshaft can be observed and the degree of torsion read while the engine is in motion by fitting two graduated plates to the ends of the crankshaft. This examination is carried out by the use of a crankcase with a glass window fitted in it. Flexions of the connecting rods can be exam-

ined and studied in the same convenient manner.

Valuable results have been obtained by the examination of lubrication systems in this manner, for under the stroboscopic rays the atomized liquids appear to be divided into distinct drops, the movement of each being easily followed.

The first practical results obtained with the Stroborama were in an examination of the formation of jets and emulsions in carburetors and in Diesel and in semi-Diesel engines. Merely by fitting windows in induction manifolds, the movement of the gases can be followed and deductions made with the greatest degree of accuracy.

The Stroborama differs from the usual type of stroboscope by reason of the entire separation of the functions of synchronizer and illuminator. The normal type of stroboscope consists of a Ruhmkorff coil illuminating a rarefied vapor or gas tube and of a rotary or alternative interrupter which constitutes the synchronizer and determines the frequency of the flashes.

With this system the moment of illumination is determined by the rupture produced in the synchronizer of the primary current of the coil.

The power of the illuminator is, of course, a function of the power of the electric source from which it is fed. But as the illuminating current must pass through the synchronizer, this very rapidly limits the illuminating power of this type of apparatus. Above a certain intensity, the arc produced at the rupture of the primary very rapidly deteriorates the contacts and robs the flash of its precision. In addition this arc lengthens the duration of the discharge, and as the



Fig. 1. Seguin Stroborama as delivered for factories

flash is not instantaneous the vision is not perfectly clear.

In the Seguin Stroborama absolute precision has been obtained by avoiding the method of rupture of a current to produce illumination. A rotary contact, S_y , Fig. 2 constituting the synchronizer, produces the discharge of a low capacity condenser charged to a few hundred volts by a continuous current generator M_2G , in the primary of a high frequency transformer, which raises the tension to that necessary for the passage of the current in the rarefied gas tube N . This discharge, by reason of the low capacity of the condenser, very incompletely illuminates the tube and only serves to "prime" the illuminating current.

The source of illumination is constituted by a powerful battery of condensers C , which is constantly maintained in a state of charge. Alternating current from electric service lines is raised to the voltage required for illuminating the neon tube by a transformer T , and changed to direct current by means of a rectifying tube S .

The illuminating tube N is a rarefied gas tube, a neon tube being used preferably, by reason of its great luminous power. This tube is brought into the discharge circuit of a battery of condensers C by the intermediary of the points E adjusted at such a dis-

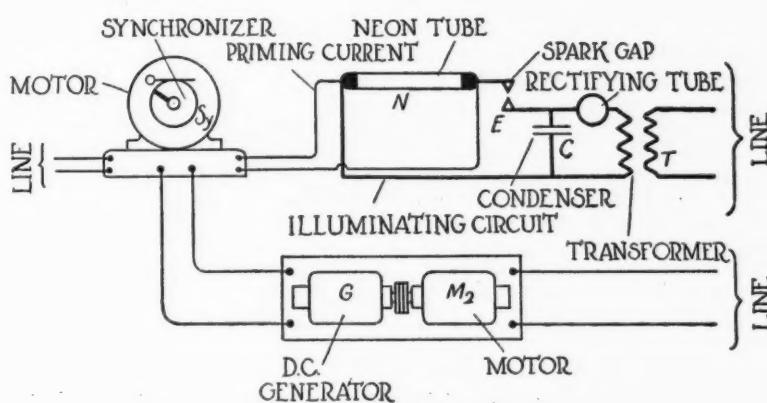


Fig. 2. Circuit diagram of the Stroborama

does not pass through the synchronizer. Further, the illuminating circuit having only little self-induction, the flash is practically instantaneous. As an indication, on a disk turning at a peripheral speed of 328 feet per second it is possible to clearly distinguish two marks 0.040 in. apart. The Stroborama is of 1000 candlepower and the power consumption is $1\frac{1}{2}$ kw.

An advantage of neon tubes is that the magnificent red light they produce contrasts with daylight and facilitates observation in well-lit workshops. It has been found advantageous, in certain cases, when observations have to be made at a distance, through field glasses (owing to projections of oil, air current from a propeller, etc.), to use red glasses, which diminish the relative importance of the external light. The instrument is manufactured by the Societe de Recherches Mecaniques et Physiques, 40 rue de l'Echiquier, Paris.

The LaSalle, a New \$2500 V-Eight

(Continued from page 362)

joint between the pump housing and bearing cap. Full pressure is supplied to all main and camshaft bearings and also to the connecting rod big end bearings. Valve stems are lubricated by the ventilating system. An AC oil filter is part of the lubrication system.

Large gauze screens, which are sweated to the baffle plate inserted between the aluminum crankcase and the pressed-steel bottom pan prevent surging and foaming and clean the oil before it approaches the pump. The normal oil capacity of the pan is 8 qts.

While the pump is located at the right side of the engine, the radiator outlet is at the left side and a rather long hose connection is used to facilitate service work and simplify connections. The pump outlet swings down under the generator and connects through a Y at the middle of the right block to the right block and (through a passage cored across the crankcase) to the left block. Temperature control is obtained by the characteristic shutters at the front of the radiator. A thermostat actuated by the heat in the top tank operates these shutters, which are of somewhat different shape from those on the Cadillac. The cooling system has a capacity of 5 gal.

A multiple disk clutch connects the engine and gearbox. All six driven and five driving disks are of carbon steel, the latter being faced on both sides with asbestos friction material of $7\frac{1}{8}$ in. diameter. Driving disks are driven from the flywheel through in-

volute teeth while the driven disks contact with six rectangular splines on the forged clutch hub. The gearbox is conventional in every respect. It has center control and gives three forward speeds and reverse. Reduction ratios of the transmission are as follows:

First speed—3.12 to 1 Third—Direct
Second — 1.7 to 1 Reverse—3.75 to 1

Gears are ground and chamfered so that operating noise is reduced to the minimum. In the design of both the crankcase and the gearbox, considerable study was given to anti-resonant characteristics. The tail shaft carries the speedometer drive gear and back of that unit a universal joint which is inclosed in the spherical housing in which the front end of the torque tube is centered. The gearbox is somewhat more compact than that of the Cadillac.

Starter drive is through an overrunning clutch as on the Cadillac, and positive foot control is used. The starting motor is placed alongside the gearbox. The upper half of the bell housing is cast integral with the crankcase, while another aluminum casting completes the lower inclosure.

An Exide 100 amp.-hr. storage battery is mounted in a pressed-steel carrier under the driver's seat and adjacent to it, on the left, is the tool box. When fender wells are not utilized for two wire wheel spares, a rim type carrier is located at the rear. Chassis lubrication is by grease gun.

Metallurgist Called Upon to Solve *Increasing Number of* Automotive Problems

Service department troubles frequently eliminated in the metallurgical laboratory, which also does research work, tests various materials and helps with new shop processes.

WITH the development during recent years of highly-organized metallurgical work in automotive plants, the industry has found an increasing number of important manufacturing problems which can be solved in this department.

Among the problems which are regularly routed through the metallurgical laboratories of most plants at present are those relating to—

1. Certain lines of research work.
2. Testing of materials (non-metallic as well as metallic).
3. Shop processes which reduce production cost without affecting the quality of any fabricated parts involved.
4. Efforts of the service department to correct certain faults which cause complaints from the field.

Service department problems are frequently referred to the metallurgist. All service departments keep records of the number of failures of different parts. The reputation of a car depends largely upon its freedom from premature failures of parts, and if any part fails in considerable numbers at an early stage of the normal useful life of a car, it is a matter that deserves the most serious attention on the part of the engineering department.

Many such failures can be prevented either by increasing the dimensions of the part in question or by using a better or more suitable grade of material. Unless the part is entirely inadequately dimensioned, which is a rather rare occurrence in this advanced state of the art, the better plan is to use a higher grade of material, at least if this can be done without materially increasing the cost. Increasing the size of the part not only adds directly to its weight and cost, the increase in weight being particularly objectionable if the part is a high speed reciprocating one, but in many cases it would be necessary to change or increase the sizes of adjoining parts.

A Rear Axle Problem

A good example of this sort of problem came to light some years ago when a prominent maker of motor trucks had trouble from the breaking of rear axle shafts. An increase in the diameter of the shaft would have meant an increase in the size of the bearings supporting it and an increase in the diameter of the axle housing which would have been objectionable on account of the addition to the unsprung weight aside from

the increased cost of the larger bearings, the greater capacity of which did not seem to be required. The trouble was completely overcome by choosing a high-grade chrome nickel steel for the shafts and treating them so as to obtain a high tensile strength and elastic limit in the completed shaft.

Trouble with drop forgings sometimes occurs if the metal is worked under the hammer at too low a temperature. The metal then does not flow so well and there is a risk of imperfections at points of the section toward which the metal must flow in the operation. Another cause of imperfections is that in a rolled bar the material at the center of the bar is not of as good quality as that near the surface which latter has been improved by the hammering and rolling process. Cracks and spongy spots may be visible at such parts of the section if the part is cut in two and the surface etched.

Trouble With Connecting Rods

In one particular case where trouble had been experienced from breakage of connecting rods in greater numbers than could be tolerated and where a so-called micrographic examination showed porous spots at the junction of the web with the flanges, where the section of the metal is the greatest, the trouble was overcome by the use of a special steel containing about 1 per cent more manganese than the steel ordinarily used for this part. Manganese has the effect of increasing the tensile strength of steel, its effect in this respect depending upon the carbon content; that is, an increase of, say, one hundredth of 1 per cent in the manganese content will increase the tensile strength of the steel the more the greater the carbon content, at least within the limits of carbon usually employed in structural steels. Manganese, however, also tends to render the steel more brittle, and it is generally considered that if the manganese content is increased to more than 1 per cent, water quenching becomes impracticable, owing to the danger of cracking.

Little improvements in details are constantly being introduced in the heat-treating department as well as in the machine shop and elsewhere, to improve results obtained and cut down costs. In case hardening parts there are usually a number of surfaces which it is desirable to keep in the normal condition, without having the surface layer highly carburized. There are two general methods in use for eliminating a case on these surfaces. One consists in leaving, say 1/32 in. of stock for machining on these surfaces while the parts are going through the carburizing process, and machining it off—thereby removing the case—after carbur-

ization is completed and before the part is quenched. The objection to this method in quantity production is obvious. Another method consists in copper-plating parts that are not to be carburized, as the carbon cannot penetrate the copper plate. In that case the surfaces that are to be carburized must be given a coating of some non-conducting material while the part is in the copper-plating bath, or else the copper plate on the surfaces to be carburized must be removed by machining before the part is placed in the carburizing box. Protection against carburization of such surfaces as that on the inside of hollow piston pins is a particularly ticklish problem. In the Packard plant it has been found possible to protect this surface by merely inserting a snug-fitting thin-walled copper tube.

Heat-Treating Practice

In the heat-treating department, the same as in the machine shop, the tendency is consistently toward more up-to-date equipment which eliminates manual labor more and more and makes the whole process nearly automatic, or at least introduces mechanical handling to the largest possible extent. The Packard Motor Car Co., for instance, recently installed four carburizing furnaces of a new type which replaced 38 furnaces of an older type. The furnaces are continuous in operation. Each furnace at all times contains from eight to 12 of the carburizing boxes and there are doors at both ends. Every 20 minutes these doors are raised simultaneously, and an air ram pushes two newly packed boxes in at one end and two boxes which have been in the furnace the requisite length of time, out at the other end. These furnaces are oil-fired. It is planned to install the same type of furnaces in the forging plant.

In connection with the heating of the parts for forging, carburizing, annealing or heat treating, the question arises whether electric or oil-fired furnaces should be used. One of the factors of importance in this connection is the price at which electric current can be obtained. As a rule electric furnace equipment runs somewhat higher, both in first cost and also in operating expense, but it is sometimes preferred in spite of these higher costs because of the more accurate temperature control possible with it. As a result of this more accurate control the percentage of rejections due to inadequate or non-uniform hardness is generally less, and this, of course, tends to compensate for the higher cost of the process.

In addition to the carburizing-case hardening process the cyaniding process is used to a certain extent for forming a hard, wear-resisting surface on steel parts subjected to shock or abrasive action. The cyaniding process may be applied in two ways, by immersing the part to be hardened in a bath of molten sodium cyanide until it reaches the temperature of the bath, usually about 15 minutes, or by sprinkling it with the powdered salt and then heating it in a furnace, which causes the cyanide powder to melt. In both cases the cyanide is broken up by the heat and the nascent nitrogen formed diffuses into the surface of the steel, forming ferrous nitrides of extreme hardness.

Cyaniding is used in many plants for such small parts as the tips of valve stems, etc., but it has probably been developed and is used more extensively in the works of Dodge Brothers, Inc., than in any other automotive plant. Instead of carburizing and quenching transmission gears, for which process a low carbon steel is required, Dodge Brothers for the transmissions of its commercial car uses a steel containing about 0.50 per cent of carbon and obtains the necessary surface hardness by cyaniding. The gears, after being completely

machined, are heated slowly in an electric furnace to the temperature of the cyanide baths and are "soaked" in the furnace at this temperature for about 20 minutes; then they are submerged in the cyanide bath for 1 minute and immediately quenched in oil. The reason for bringing them up to the cyaniding temperature gradually is that this reduces distortion.

Many other parts are also cyanided in the Dodge plant, but the majority of the smaller parts are placed in the cyanide bath while cold and are heated therein, which requires about 15 minutes. All of these cyaniding furnaces are operated 24 hours per day. As is well known, sodium cyanide is a poison and the greatest precautions are taken to ventilate thoroughly the heat-treating room and to provide all of the baths with hoods which carry off all fumes above the roof. The atmosphere in this heat-treating plant is just about as good as that in any machine shop.

One of the most important metallurgical developments in recent years has been in connection with plating processes. It will be remembered that about four years ago the practice of nickel plating radiator shells was introduced in this country and this led to a good deal of research looking to the improvement of this process. Nickel plating has been widely used previously in various lines of industry, but where applied to parts that are exposed to the weather, such as cycle parts, it had never been very satisfactory. Investigation showed that a coating of nickel deposited electrolytically is usually very porous, and therefore is not a good rust-proofing coating, as particles of moisture will enter the pores and reach the steel surface underneath, so that it usually is not very long before signs of corrosion appear.

By giving the steel shell one or more preliminary coats of copper it can be given better protection against corrosion, but this, together with intermediary processes, adds to the expense. Much experimental work has been done in consequence with a view to improving the rust-proofing qualities and the quality of finish of the plate, and reducing the cost of the process, and research along this line has recently led to the development of the chromium plating process which is as yet only in its early stages.

EXPERIMENTS with a view to developing an alloy for steel balls more suitable for determining the hardness of very hard materials by the Brinell method than the Hultgren balls now used, have been made at the Bureau of Standards and are dealt with in a paper on Iron-Carbon-Vanadium Alloy for Brinell Balls, read by G. W. Quick and L. Jordan before the American Society for Steel Treating recently. The alloy used contained 2.93 per cent of carbon, 0.10 per cent of manganese, 0.016 per cent sulphur, 1.55 per cent silicon and 13.5 per cent vanadium. The balls were turned 0.001 in. over size and were subjected to various heat treatments. In this condition tests for flattening under load and rebound tests were made on them. Later they were work-hardened by being placed between ball races which were revolved one with relation to the other when under heavy load.

In concluding their paper the authors state that work-hardened iron-carbon-vanadium steel balls have been produced which are more resistant to permanent deformation than Hultgren balls. These offer no appreciable advantage over Hultgren balls for testing materials up to 700 Brinell, but should be superior to Hultgren balls for materials of 800 Brinell and over. In tests of these harder materials the elastic deformation of the ball plays a major part, and balls for such tests should have greater resistance to deformation.

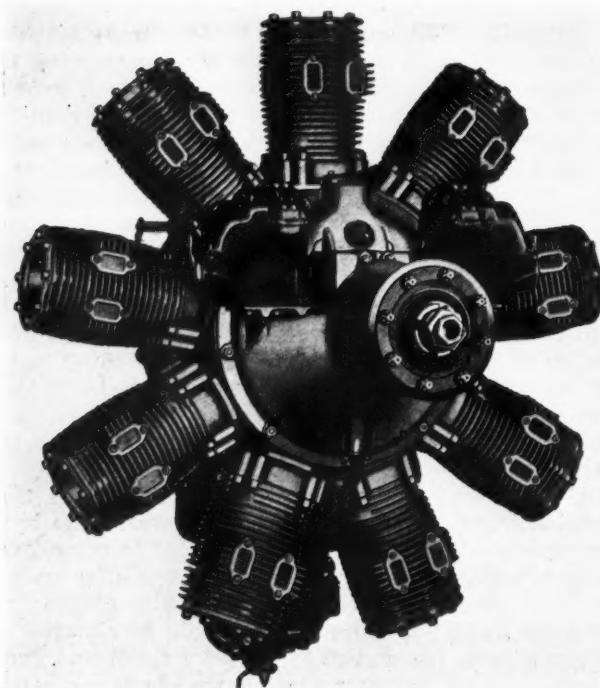
NEW DEVELOPMENTS—Automotive

Continental Aircraft Engine

AMONG other models of the Burt-McCollum type of single sleeve valve engine which have been developed by Continental Motors Corp., is a nine-cylinder radial air-cooled aircraft engine which is illustrated herewith. The cylinders have a bore of $4\frac{1}{2}$ in. and a stroke of $5\frac{1}{2}$ in. and the engine develops 220 hp. at 1800 r.p.m. The displacement is 787.25 cu. in. and the weight 475 lb. without starter but with carburetor and ignition unit. A very favorable report on single sleeve valve engines for aeronautical purposes was made recently by the British Aeronautical Research Committee.

The engine is of the fixed radial type and its cylinders are cast of gray iron with integral cooling fins. The single-throw crankshaft is of the built-up type and connected to it is a master connecting rod, to which the other connecting rods are articulated. Connecting rod bearings are plain but the crankshaft itself is supported on ball bearings. The timing gear is located on the side opposite the propeller. A sleeve-operating mechanism similar to that used for the automobile engine, which has been described in *Automotive Industries*, is used. Exhaust ports are located on the propeller side, the inlets on the opposite side. There are three inlet and two exhaust ports in the cylinder wall. The two exhaust ports extend directly through the wall and are surrounded on the outside by bosses to which an exhaust manifold may be bolted, while the three inlet ports are combined in one for the connection of the inlet pipe.

The crankcase, which is made of aluminum castings, consists of three parts, a central ring and two heads. A supercharger of the centrifugal type is built into the crankcase on the side opposite the propeller. Two magneto's are mounted on the propeller side, as shown in the



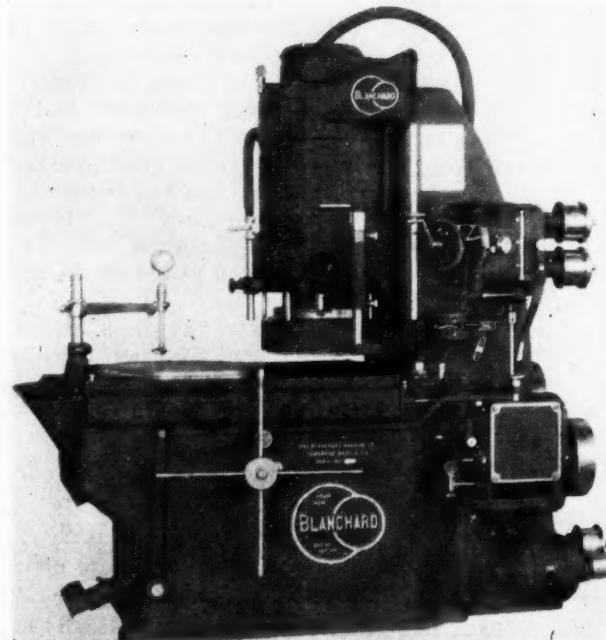
Continental single sleeve valve air-cooled radial 220-hp. aircraft engine

illustration. Two tubes connect from the carburetor to the lower part of the crankcase, while nine radial tubes extend from the crankcase to the inlet ports. The inlet tubes are oil-jacketed.

Improved Surface Grinder

ARECENT improvement in the No. 16 Blanchard surface grinder is a new base, which has larger water capacity and also a longer bearing on the floor, although the overall length is increased only 2 in.

The illustration shows the standard No. 16 surface grinder with 26-in. magnetic chuck and caliper attachment. The new base holds over 100 gal. of coolant, as



Blanchard surface grinder with enlarged base

compared to 65 gal. in the old base. This additional capacity helps to keep the work and machine cooler on heavy grinding. The treadle shaft is neatly housed in the end of the base. The other end of the base, under the column, is carried straight down to the floor, instead of being undercut. The motor connections, formerly in a box on back of the base, are now inside the column, but easily accessible.

Batch Boards for Trucks

HEIL batch boards made by the Heil Co., Milwaukee, Wis., consist of steel divider plates mounted on trunnions and equipped with an automatic locking device so that dump truck bodies of all kinds may be equipped to carry two or more batches of material per load. The steel divider plate is flanged over at the sides to give stiffness, with the flanges turned away from the load. The batch board is bolted to the upper flange of the truck body with brackets.

When the operating handle is raised the partition is lifted about 1 in. by the action of an eccentric and re-

Parts, Accessories and Production Tools

leased from its latch so that the weight of the load swings the partition open as it dumps out. By pulling down the operating handle the partition automatically locks itself in position as it swings back when the body is lowered. Although designed especially for use on Heil dump bodies, the device can be installed in any make of dump body.

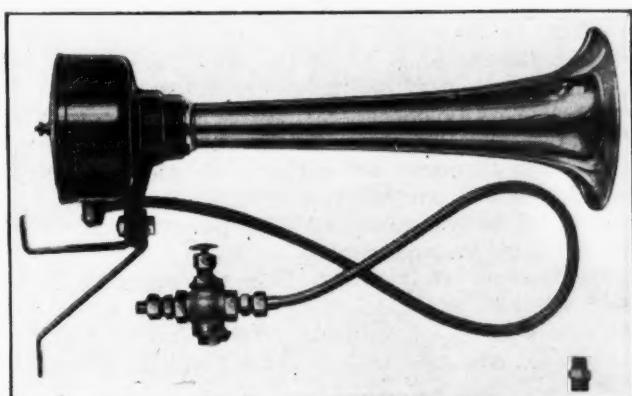
Starrett Measuring Instruments

A NEW tool recently placed on the market by The A. L. S. Starrett Co., Athol, Mass., combines a drill point gage, hook rule, plain rule, depth gage, try square and slide caliper all in a single instrument. It consists of a 6-in. steel rule with a sliding head which makes contact with the rule at an angle of 59 deg. A knurled thumb screw locks the head at any desired point.

Another new tool just developed is a thickness or feeler gage with 26 leaves which has a complete range from .0015 to .025 in. The new gage contains four sizes not found in previous combinations—.0015, .0025, .002 and .003 in. The leaves are 3 1/16 in. long and 1/2 in. wide.

Air Horn for Trucks and Buses

A POWERFUL horn operated by compressed air and designed for use on buses, trucks, street cars, railroads and boats has been placed on the market by J. Thos. Rhamstine Co., Detroit, Mich. The principle of the new air horn, known as the "Typhoon," is similar to that of an organ pipe where the tone is secured by resonance. It is essential that the vehicle or craft to which the horn is to be attached is provided with a means of compressing air. An adjustment is embodied in the horn to enable it to be used with air pressures ranging between 25 and 100 lb.



Typhoon air horn

The projector or horn is formed of polished aluminum with the body in black enamel. Operation of the horn is by a valve placed on the floor boards and controlled by the foot. A flexible metal hose with 1/4 in. couplings is provided to join the horn to the operating valve while the connection between the air tank and the valve may be made in the usual manner with copper tubing. The shipping weight is 8 lb.

V-R Electric Fuel Pump

IN an electrically operated fuel pump that has been placed on the market by the V-R Fuel Pump Corp., Detroit, Mich., a gasoline filter is formed integral with the pumping unit. The device itself is very simple and may be installed in a few minutes on any part of an automotive vehicle either above or below the level of the carburetor. After attachment to the engine, frame or dash it is necessary only to connect the terminal on the pump with the battery side of the coil or to the ignition switch. Its operation is automatic with the turning on of the ignition switch so that in coasting down a hill with the ignition turned off, no fuel can reach the carburetor. As will be seen from the illustration, the fuel enters the pump on the left side and has to pass through the glass bowl containing the screen before going to the carburetor. The filtering element is quickly detachable by unscrewing the knurled nut and lifting the bail retainer. Among the advantages claimed for this filter are that it will operate under all conditions of temperature, altitude or grade, will function when the battery is too weak to operate the ignition, is not affected by vibration and will deliver over 15 gal. of fuel per hour.



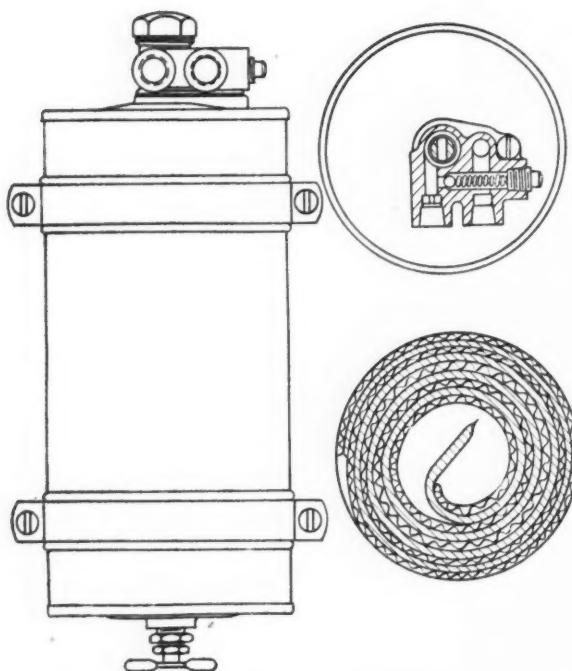
V-R electric fuel pump

Vest-Pocket Indicator

A HANDY vest-pocket speed indicator, No. 746, for testing the speed of shaftings, etc., is being announced by the Brown & Sharpe Mfg. Co., Providence, R. I. After the operator has set the instrument at zero he places his thumb directly on the small dent in its side and applies the rubber point to the center of the wheel or shaft. At every 100 revolutions the steel plate lifts beneath his thumb. The operator counts the number of lifts during one minute and then adds the number of units of five which appear in the slot at the top of the instrument. For speeds of less than 100 r.p.m. the indication in the slot gives the speed directly.

Tillotson Oil Filter

AN oil filter making use of a fibrous filtering element has been placed in production by the Tillotson Manufacturing Co., Toledo, Ohio. The filtering material is supported by wire cloth and is wound into a spiral coil, as shown in the illustration. Oil entering



Elevation and sectional views of Tillotson oil filter

the filter from the pump is forced between adjacent convolutions of the filtering material at the center of the device. It passes through a section of the material and thus reaches the outlet. As the first section of the filter becomes clogged up with sludge, the pressure on the oil increases, the inner convolutions of the filtering material are separated and the oil penetrates farther and farther into the roll of filtering material. It will be noticed that a safety valve is provided which allows the oil to flow directly from the inlet to the outlet if the filter should become completely clogged. The filter is made in cylindrical form and can be readily secured to the forward side of the dash.

Miller Has New Tire

A NEW type of balloon tire construction has been developed by the Miller Rubber Co. The tire consists of a one-piece tread and sidewall, with a flat-shape tread giving approximately 38 per cent more road surface than round tread types. The tread and sidewall are built as a unit, the sidewall extending over the entire surface to the bead. The usual seam where the tread joins the sidewall has been eliminated. Elimination of "spotty" wear and the reduction of internal heat through the "Uniflex" cord construction are expected to add many miles of extra service to the tire, which is built to flex as a unit, with an unusually small amount of internal friction.

Clipper Speed Lacer

WITH the new Clipper Speed Lacer, a product of Clipper Belt Lacer Co., Grand Rapids, Mich., it is possible to lace both ends of an eight-inch belt in 1½ minutes. With a three-quarter turn of the crank handle a pressure of 45,900 lb. is developed which forces the Clipper hooks into the belt in alignment and flush with the surface of the belt. Belts from 1 to 8 in. wide can be laced in a single operation.

Analyzing Indicator Diagrams

INDICATOR diagrams have not been used extensively in studying the performance of high speed internal combustion engines, and the general impression seems to be that the reason for this is to be found in the numerous possible sources of error in taking such diagrams on high speed engines. It appears, however, that even in the field of larger stationary and marine internal combustion engines the indicator method of investigation is not very popular, and Prof. P. H. Schweitzer of Pennsylvania State College, in Bulletin No. 35 of the Engineering Experiment Station, entitled "The Tangent Method of Analysis for Indicator Cards of Internal Combustion Engines," expresses the view that one of the drawbacks has been that it is difficult to interpret the records directly in useful terms. An indicator card shows the pressure change in the cylinder in relation to piston travel but fails to show the heat movement, i. e., where heat is given up and where it is absorbed by the working fluid.

It has been customary to use exponents n as a source of information regarding the heat flow. Several methods have been proposed to evaluate the exponents from the indicator diagram, but all of them are more or less cumbersome and none has come into extensive use. The author has developed a new method of analysis, known as the tangent method, for which it is claimed that it is simple in application, is sufficiently accurate and has been of distinct assistance in testing internal combustion engines.

In the bulletin the new method is fully explained and its application is shown on numerous diagrams from engines of different type. It is pointed out that whenever during the expansion in an engine cylinder the value of the exponent n for any small part of the expansion curve is smaller than γ , the ratio of specific heats, heat is being supplied to the charge (by after burning), whereas when n is greater than γ , heat is being lost by the charge. During the compression stroke, on the other hand, if n is smaller than γ , heat is lost by the charge (through the walls). The subject appears to have been investigated quite thoroughly and the bulletin should prove of much interest to those seeking information on the phenomena of combustion and heat flow in internal combustion engines.

THE International Nickel Co., New York, announces a new grade of electrolytic nickel produced at its works at Port Colborne, Ont. It is being produced by the Stanley process, developed by R. G. Stanley, president of the company, but with certain modifications in the electrolytic operation. This new product, it is stated, will have a purity of 99.90 per cent and will be free from carbon and sulphur.

The new nickel is produced in the standard 27 by 36-in. cathode, weighing approximately 150 lb., or it is cut into squares of different sizes, down to 1 in., as the trade requires, and in this form is known as "Electro Squares." Present capacity for the production of electrolytic nickel is approximately 750,000 lb. per month, and this will be added to as required.

Correction

ELFLEX fabric spring shackles instead of rubber shock insulators are used in the spring suspension of 1927 Elcar chassis. This statement is made to correct an error which occurred in the Elcar description on page 54 of the Jan. 15 issue.

Movement Toward Superchargers for Automobiles Predicted

British expert thinks that forced feeding offers easiest means of obtaining further increase of brake horsepower per unit of displacement. Several advantages are cited.

THE advantages of supercharging for all aircraft purposes are strongly emphasized in a paper recently read before the Institution of Automobile Engineers (England) by A. H. R. Fedden, and it was predicted that within the next few years the engines of all classes of military aircraft will be supercharged as a matter of course. Mr. Fedden points out that the introduction of the supercharger has proved the value of the air-cooled engine for aircraft work, for its has been found that supercharging can be applied to this type of engine without the necessity of additional cooling; this does not hold for the water-cooled engine, which requires additional radiator capacity.

From experience gained in the study of superchargers for aircraft work, and from a review of the development of the motor car, the author prophesies that before very long a change of thought in respect to the application of superchargers to motor vehicles may be expected. In putting forward the claims for supercharging for the motor vehicle engine, it is not suggested that the application of this device is the panacea for all its present ills, nor that by its introduction any drastic change in the chassis, such as the elimination of the change speed gear, could be effected; rather is it suggested that its introduction is what would be expected from a consideration of the history of motor car design.

What are the outstanding features in the evolution of the motor vehicle during the past fifteen years? The salient points are greatly increased performance, with very much more comfort, from much smaller power units. To obtain these results complication and expense have not stood in the way in the case of the number of cylinders, the application of electric lighting and starting, and the fitting of front wheel brakes.

Better Performance Possible

All these features, in their particular sphere, have contributed toward the performance and comfort of the present-day motor car, and without them even the moderately priced vehicle could not hope to compete. It is agreed that we have not by any means arrived at the limit of brake horsepower per litre for motor-vehicle engines, but it is submitted that a further increase will be obtained most readily by the introduction of forced feeding to the cylinders in the form of a positively-driven compressor.

The author admits that the compression-ratio of the supercharged engine may have to be reduced, as the limiting factor is the detonating characteristic of the fuel, also that as a positively-driven compressor is necessary for motor-vehicle work, there is a net loss in power

and fuel to drive the supercharger. In spite of this he believes that the compressor offers the best field for exploration for increasing the output from a given engine volume.

With a supercharged engine smaller valves, cams with lower accelerations and moderate lifts can be employed, and this same mechanism can still cope with the charge at high speeds. Engineers familiar with the design of poppet-valve operating gear for high-speed engines will realize what this means. The design, maintenance and noise of the poppet-valve gear on high-speed engines is a very serious matter. With a supercharged engine a compromise with valve timing and overlap is not necessary.

Perfect Distribution Obtained

With a supercharger operating on the engine side of the carburetor, practically perfect distribution is obtained owing to the mechanical mixture of the fuel giving better atomization with consequent great improvement in smooth running. With this correct distribution the best carburetor and ignition setting can be obtained, with further improvement in power and fuel consumption, instead of a compromised setting, which is inevitable with the naturally-aspirated engine.

The author considers it possible to evolve a reliable, compact and effective compressor for a touring-car engine, costing under \$100 when fitted, operating on the delivery side of the carburetor with mild boost which will very considerably improve the power, acceleration, smooth running and quietness of the car.

Although fuel consumption has not been one of the main considerations in the past in motor-car development, because variations in temperature, climate and grades of fuel have made this impractical, nevertheless, it is believed that a supercharger can be added for a very small addition to the overall fuel consumption, because with a supercharger for a given performance a smaller engine can be used from which there will be less recourse to low gears. The better distribution also will improve fuel consumption.

For large vehicles for commercial purposes the adaptation of the supercharger is a somewhat different problem. In this sphere, also, it is believed there is hope of success. Alternatively, it might be most economical to employ a smaller engine running on practically full throttle for normal running, and use supercharging for only maximum power, which will result in a considerable saving in fuel as 75 per cent of the running would be accomplished on an economical portion of the throttle curve, which is not the case with a normal engine, or it

might be advantageous to employ a separately-driven compressor to be used at will for acceleration, the avoidance of changing of gear, etc.

Whatever the final solution may be, it is believed that supercharging for commercial work will enable smaller engines to be used, giving smoother running, less wear and tear on the transmission, and the speeding up of traffic generally in congested areas due to better acceleration and less gear-changing.

As the art of supercharging is advanced (the author observes) this mechanism will be applied as a standard to commercial aircraft, with a consequent all-around increase in efficiency. Most probably the supercharger will not be used continuously, but will be employed for a mild "ground boost" to obtain maximum power for the take-off, and the engine will then be used as a normally-aspirated one at an economical point of the throttle curve. The paper deals only with the application of superchargers to four-stroke engines. The subject of supercharging two-stroke engines was purposely avoided by the author, who holds that this is a field by itself and gives it as his opinion that the moment the two-stroke engine is considered from the standpoint of supercharging the whole problem, which previously appeared rather hopeless, becomes a very interesting one.

In the first part of the paper the history of supercharging is dealt with, and descriptions with illustrations are given of the various existing types. The author then passes on to a consideration of engine problems in connection with supercharging, starting with a discussion of its influence on valve timing.

Overlap Can be Reduced

With a supercharged engine the valve timing approaches that of a normal slow-speed engine; the overlap can be reduced and even eliminated. In the case of a gear-driven blower, a moderate amount of overlap is permissible, depending upon the r.p.m. and gas speeds of the engine; with an exhaust-driven turbo-blower, no overlap can be allowed, on account of the comparatively high terminal exhaust pressure. The lateness of closing of the inlet valve can be reduced as, on account of the pressure available in the induction system, the volumetric efficiency is increased. Late closing would reduce the volumetric efficiency owing to the pumping back of the mixture.

Owing to the high expansion pressures of a supercharged engine, the exhaust valve need not be opened so early; in fact, if this is attempted, the loads imposed on the valve gear will be high, and the exhaust valves will become exceedingly hot. A comparatively late exhaust opening is therefore advisable.

When a blower is fitted to a radial-engine crankshaft, the system consists of two equivalent shafts carrying three flywheels, namely, the propeller, the crank system, and the blower. Such a system will have two synchronous speeds, and it is essential either to avoid both, or to place them in the region where practically no running is done, as, for example, below cruising speed. This may be done by incorporating a flexible coupling in the drive of the supercharger blower, thus reducing the stiffness of its equivalent shaft. In this connection it should be noted that the equivalent moment of inertia of the impeller is obtained by multiplying the actual moment by the square of the gear-ratio. The figure thus obtained may be quite an appreciable proportion of the propeller inertia, and will probably be considerably larger than the moment of inertia of the crank masses.

In the case of line engines, the effect is even more complicated, owing to the number of harmonics present in the system. It is generally advisable in this case to

make the blower serve as a torsion damper, in which case mathematical prediction of the synchronous speeds of the system becomes difficult.

Heavier Parts Needed

Supercharging increases both the mean effective pressure and the explosion pressure. Its effect, therefore, resembles that of an increased compression ratio, but there are some important differences. In the first place, the explosion pressure for a given mean effective pressure is less in the supercharged than in the high compression engine, and the diagram is "fatter," that is, the expansion line is higher in the supercharged diagram. The pistons, piston pins and connecting rods must be designed to withstand this extra load, and the crankshaft must be designed to transmit the extra torque. For engines having a 5:1 compression ratio the increase in maximum explosion is 30 per cent for a 50 per cent supercharge, against 125 per cent for an equivalent increase in compression ratio.

Compression during the process of supercharging increases the temperature of the entering charge. In spite of the cooling effect of the fuel, the temperature of the entering gases increases rapidly with the degree of boost. At both the R.A.E., Farnborough, and the Altitude Laboratory of the U. S. Bureau of Standards exhaustive tests were made to determine the influence of the temperature of the entering gases on engine performance. With supercharge pressures of 5 to 6 lb. per sq. in. and upward and temperatures of entering gases of 122 deg. Fahr., inter-coolers are found necessary.

The liberation of a greater number of heat units in the case of a ground-boosted engine, or the liberation of the same number of heat units in a rarified atmosphere where the boiling point of the water is appreciably reduced (176 deg. Fahr. at 20,000 ft.) naturally presents another difficulty and necessitates additional cooling for the water-cooled engine. Air-cooled aircraft engines, however, score considerably in this respect, in spite of prophesies to the contrary. In practice air-cooled supercharged aircraft engines have been found to function quite satisfactorily owing to their margin for full-power ground conditions, whereas with water-cooled engines it has been found necessary to increase the cooling capacity about 30 to 35 per cent. For production motor-vehicle engines, a quite reasonable increase in radiator capacity has been found sufficient.

Thermal Efficiency Reduced

It must be admitted that with a supercharger the thermal efficiency of the engine will be reduced; firstly, because of the power necessary to drive the supercharger; secondly, because thermal efficiency depends upon expansion-ratio, and, when supercharged, an engine is supplied with a greater charge than normal. Further, there is a limit to the detonating qualities of commercial fuels, necessitating a lower compression-ratio, thereby lowering the thermal efficiency still further. This drop in efficiency will increase in proportion to the amount of supercharge employed. This will not prove a serious drawback to the supercharger in the case of the aircraft engine in which the supercharger is used for correcting loss of power due to altitude, or in the case of the motor car engine when used to compensate for loss of volumetric efficiency. It would also appear feasible for the moderately "ground-boosted" aircraft engine intended for operation at high altitudes, and where the power will commence to fall off directly the aircraft leaves the ground. Where an increase in output is required under conditions of normal efficient filling, such as is experienced with racing motor cars,

the resulting effects on temperature, pressure and fuel consumption present considerable difficulties. With the latter conditions, heavy fuel consumption, greatly increased cooling difficulties, and considerably higher mean loadings must be faced. By the introduction of special dope, such as tetra-ethyl lead, some of these difficulties may be alleviated.

At present, therefore, for commercial use we must look to the supercharger chiefly as a means to maintaining good volumetric efficiency at high piston speed.

When supercharging motor vehicles for general use, and employing a mild boost, adverse heat conditions will not present very serious difficulties. For aircraft engines, however, which normally work with fuller throttle

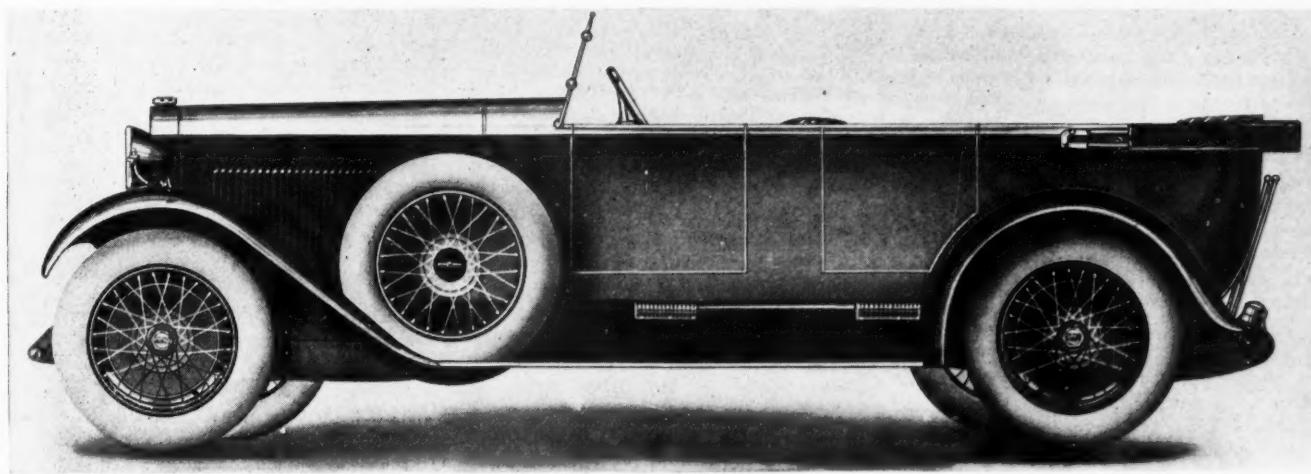
openings, the conditions are somewhat different. Pistons, piston pins, and connecting rods require attention to deal with the adverse heat conditions and increased pressures. For these engines drop-forged "Y" alloy or duralumin pistons have been found satisfactory, and when properly tooled up do not add seriously to the cost of output owing to the low percentage of scrap.

Correct lubrication of the blower bearings has called for some careful development work. Both the R.A.E. and the Air Service Engineering Department have found it more satisfactory to feed the bearings by separate metering pumps to insure that sufficient oil without excess is fed. Bearings can now be run at 25,000 to 30,000 r. p. m. without difficulty.

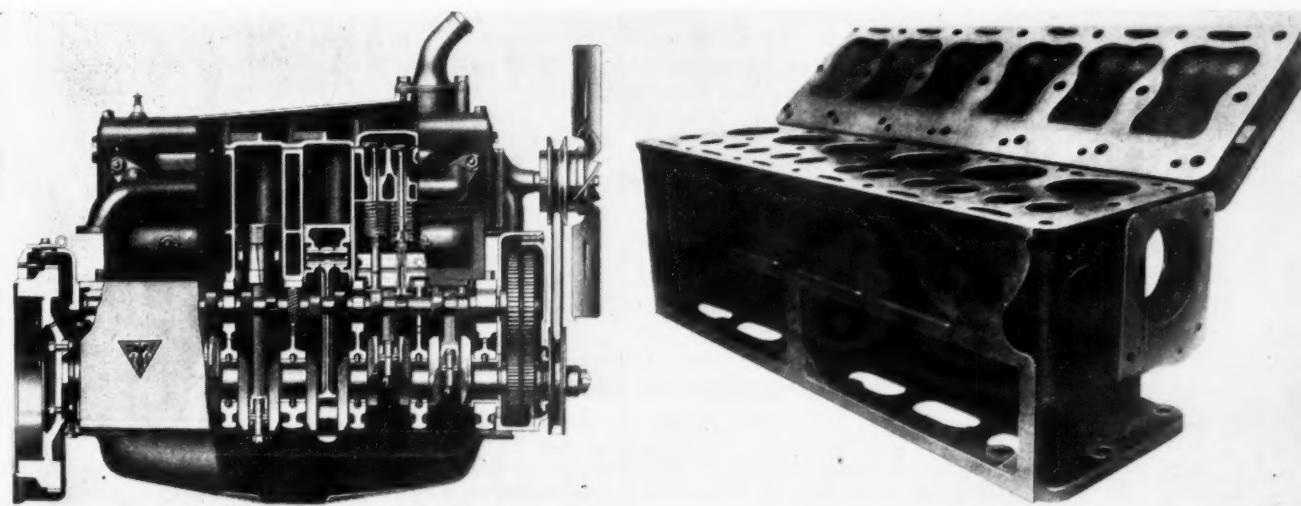
Adler Six Design Follows American Practice

ONE of the first cars designed in Germany to meet the new conditions of foreign competition is the Adler Standard Six of the Adler Werke, Russelsheim-on-Main. It is designed somewhat along American lines, with an acceleration of 5 to 40 km. p.h. in 8.8 sec., which, while not high from the American standpoint, is extraordinary among German cars. Much new manufacturing equipment has been installed, and the produc-

tion methods applied to this Standard Six and to a 1½-ton high speed truck, also recently added to the line, are said to be thoroughly up-to-date. Among the items of equipment of the passenger car may be mentioned an oil filter, centrifugal air cleaner, front and rear bumpers, shock absorbers, four-wheel hydraulic brakes and swiveling headlights. Both the open and the closed bodies are of all-steel construction.



ABOVE: The Adler six-seater with six-cylinder engine and four-wheel brakes. BELOW: Longitudinal section of Adler Standard Six engine and the cylinder block and head



AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

Saturday, March 5, 1927

Plants Expand Operations as Sales Continue Gains

PHILADELPHIA, March 5—The month opens with most of the large producers of motor cars at or near capacity operations. Although sales are showing a territorial variation in volume, they are not far below the level of a year ago for the industry as a whole, and in particular instances they are exceeding former marks for the season. The market is not as good as last year in the South, but is somewhat better in nearly all other parts of the country.

Export business has been progressing satisfactorily, having held up very well during the winter. December exports are estimated at 26 per cent of the total production of the industry, probably the highest ratio so far established. Although this represents seasonal influence, and the January proportion was not so high, there was an actual gain in volume in the exports of the first month of the year.

The excellent domestic sales record for new cars established in February was made in the face of obstacles that might fairly have been expected to cut heavily into the market. Reports of unusually keen competition in the industry circulated in the early part of the year apparently led to an expectation of price cuts. When this proved unfounded the public began buying. Experience has shown, furthermore, that the brightly colored cars now more than ever in general production are particularly poor sellers in bad weather, as purchasers are reluctant to drive them through slush and rain. Even this resistance was in a measure overcome.

Reports from trade centers are much more optimistic than a month ago. Dealers generally have found sales of

(Continued on page 388)

Buick Inaugurates Used Car Guarantee

DETROIT, Feb. 28—A copyrighted method of merchandising used cars is being put into effect by the Buick Motor Co. Cars sold under the plan will be known as Gold Seal used cars. They will be thoroughly reconditioned by the branch or dealer and will be sold with the same guarantee as applies to a new Buick. The same terms as prevail on new cars under the General Motors Acceptance Corp. plan will prevail with the exception of the variation in insurance as it affects a used automobile.

The plan was put into effect today for the first time at the factory branch in Flint which is opening a new used car department. It is understood that it will soon be adopted generally.

NEWS SECTION

MARCH PRODUCTION TO INCREASE TO 316,000

NEW YORK, March 2—Heavy production gains for a majority of motor car and truck companies in February are indicated by preliminary estimates available today. The total for the industry, United States and Canada, is put at about 316,000 units, against 249,506 in January and 376,308 in February a year ago.

As Ford's output is known to be lagging considerably behind his early 1926 figures, the showing for the other companies was correspondingly better.

Chevrolet to Hit 106,000 in March

DETROIT, March 3—Chevrolet Motor Co. will build 106,000 automobiles in March. The Chevrolet plant at Flint is now operating night and day and is turning out 25,200 engines a week. To maintain its March schedule Chevrolet will build at the rate of 4200 automobiles a day. February output totaled 85,821 as against 51,303 in February, 1926.

Reports from other Detroit companies also indicate higher schedules in March.

Hupp broke its February records when it shipped 4106 automobiles, exceeding January shipments by 49 per cent, according to R. S. Cole, general sales manager. Hupp has set production schedules for March which will exceed any other month in the company's history. In February Hupmobile started shipments of two of these three custom body types developed by Dietrich.

Buick Motor Co. has 25,000 cars scheduled for March production. Sales at retail are reported by the factory to have been running in excess of the early months of 1926. February shipments from the factory totaled 18,260.

Oakland Motor Car Co. produced 9696 cars in February and has laid down a March schedule of 13,700. The February shipments included 7225 Pontiacs and 2410 Oaklands.

Spicer Earnings \$1,638,989

NEW YORK, Feb. 28—Net earnings of Spicer Mfg. Co. for 1926 were \$1,638,989, equal after preferred dividends to \$4.51 a share on common, against \$4.45 in 1925. The company was reported as out of debt with favorable prospects for good earnings in 1927.

Rickenbacker Sale Set

DETROIT, March 1—Rickenbacker Motor Co. will be sold at auction between April 10 to 15 under Federal Court order, following application by the receivers.

Minnock Resigns as Ford Manager

PHILADELPHIA, March 2—Peter F. Minnock, for many years manager of the Ford Motor Co. plant in Philadelphia, resigned this week. A dinner was tendered Mr. Minnock by 60 Ford dealers in this territory and he was given a platinum watch in token of the friendly relations covering many years. He will be succeeded by Edward Abbott, who has been manager of the Houston, Texas, branch.

Mr. Minnock was one of the oldest members of the Ford organization in point of service. He was a personal friend of Henry Ford and was in the bicycle business in New Bedford, Conn., with Gaston Plaintiff, Ford's New York manager, previous to joining the Ford organization 20 years ago. During the war Mr. Minnock was engaged in the production of Ford Eagle boats.

N.A.C.C. Traffic Heads to Meet City Officials

NEW YORK, March 2—A conference of mayors, commissioners of public safety and other municipal officials will be held in Chicago, April 13 and 14, for the discussion of ways and means for best handling of city traffic congestion, as a result of the action taken today by the city traffic committee of the National Automobile Chamber of Commerce.

The conference is expected to act as a clearing house for the latest and best traffic plans and systems.

Austin to Sell in Germany

LONDON, March 5 (by cable)—Sir Herbert Austin announces that his company has just concluded an agreement with the Gothaer WaggonFabrik, Eisenach, Germany, for the latter to manufacture and sell the Austin "seven" in Germany and eastern Europe. The car will be sold under the name of Dixi.

Chapin Succeeds Clifton as N.A.C.C. Head

Chamber Makes First Change in Presidency Since Organization

NEW YORK, March 2—Col. Charles Clifton today resigned as president of the National Automobile Chamber of Commerce, a position he has held since 1904, when association work began in the industry. In his stead the directors elected Roy D. Chapin, chairman of the board of the Hudson Motor Car Co.

Though Colonel Clifton's resignation was not entirely unexpected, as he has before asked to be relieved of the burden of active leadership, the foremost automotive executives expressed to him their regret that he should relinquish the presidency and paid tributes to his long record of constructive work.

In Mr. Chapin, the chamber secures as its head one of the outstanding figures in the development of automobiles to the leading manufacturing industry of the country. He has held the position of vice-president of the chamber and in this is succeeded by Alvan Macauley, president of the Packard Motor Car Co.. To Mr. Macauley's post as vice-president of the passenger car division, the directors elected Alfred H. Swayne, vice-president of General Motors Corp.

Gets Honorary Post

As a fitting recognition of Colonel Clifton's service, he was named honorary president and honorary director, and is the first man to be placed in this position by the industry.

Always a strong advocate of association work, Colonel Clifton is considered to have been the leading exponent of cooperative competition. When the cross-licensing agreement for exchanging patents was contemplated, his was the first announcement that the Pierce-Arrow Motor Car Co., of which he was president, would sign the agreement. That led the way for all others so that each car maker might easily enjoy the advance in science of the industry developed by all.

He has never tried to dominate, always seeking rather to guide and advise. He has been a chief of the "silent" type, believing that diplomacy and common sense will accomplish more than any attempt at steam roller methods.

In reelecting Colonel Clifton unanimously year after year, the chamber has shown its appreciation of his qualities. He had the vision to see that motor transportation is destined to the same success abroad that it has had in this country and he has encouraged the

RETIRING N. A. C. C. PRESIDENT AND HIS SUCCESSOR



Charles Clifton



Roy D. Chapin

Colonel Clifton, chairman of the board of Pierce-Arrow Motor Car Co., has been a leader in the association work of the industry since 1904. Mr. Chapin, chairman of the board of Hudson Motor Car Co., became secretary of the N.A.C.C. in 1913 and has served as vice-president prior to his election to the presidency

comprehensive program of foreign trade development undertaken by the N.A.C.C.

Colonel Clifton has always held the position that an industry must be prosperous as a whole if its units are to be successful and so far has he developed the principle of unity on fundamental questions that no automobile manufacturing company in the chamber has ever sued any other company.

Although, having passed the three-score and ten mark, Colonel Clifton is withdrawing from active association work, he still retains many of his civic activities in Buffalo and the chairmanship of the board of the Pierce-Arrow Motor Car Co.

Among the telegrams of regret received by Colonel Clifton were the following:

Alfred P. Sloan, Jr., president, General Motors Corp.: One of the great foundation stones of the automobile industry has been the unparalleled leadership which it has enjoyed in Colonel Clifton. His clear vision, his ability to see essentials, his optimism, his understanding of economics have always made him a sane guide for others to follow. All his associates deeply regret his retirement and recognize that he has set an example and established principles which will be an abiding and permanent guide for this business.

Edward Ver Linden, president, Peerless Motor Car Corp.: We will miss his active cooperation and influence for all that has been good in the automobile industry.

Alexander Winton: His influence in the

Incoming President Has Noted Career

NEW YORK, March 2—Roy D. Chapin, new president of the National Automobile Chamber of Commerce, though relatively a young man, has been an outstanding executive in the automotive industry for many years.

Like many of the early executives he received his initial training as a young man in the Olds Motor Works at Lansing, becoming general sales manager in 1904.

Leaving there he joined with Hugh Chalmers in the formation of the Chalmers Detroit Co., but after two years these men each agreed to form his own separate organization, which led in 1910 to the establishment of the Hudson Motor Car Co. by Mr. Chapin. He was president until four years ago, when he became chairman of the board.

Mr. Chapin's prominence in the industry has been fully as great in the general field of motor transport as it has been in his own company. He has been vice-president of the National Automobile Chamber of Commerce for many years, and has devoted himself particularly to the development of highways, as chairman of its highway committee.

While with the Olds Motor Works he made one of the first cross-country trips from Detroit to New York, doing

(Continued on page 385)

(Continued on page 385)

Three Companies Merge in France

Chenard - Walcker, Delahaye and Unic Units to Form Strong Organization

PARIS, Feb. 12 (by mail)—Chenard-Walcker, Delahaye and Unic have just been grouped into what is generally described here as a French General Motors. The three firms, which are all in a strong financial position, and are of about equal importance, will remain autonomous so far as their internal management is concerned, but have already decided on a one-model policy for each, a grouping of their sales organization, and a common purchasing and engineering department, and an important scheme of standardization.

This movement is looked upon as an important one, for all three units occupy a strong position, despite the fact that they have grown toward a variety of models and have unnecessarily high overhead charges. Chenard-Walcker has the greatest variety, with some half-dozen passenger car models and two tractors; Delahaye has four passenger cars and a very wide range of trucks and special vehicles; Unic has two passenger cars and two truck models. The changes decided on affect passenger only, for it is here that the firms are in closest competition.

It is quite possible that other groupings of French firms will be announced in the near future. The tendency is for a small number of firms of practically equal standing to be drawn together, rather than for one big firm to absorb smaller units.

Although at present passing through a difficult period, it is believed that the ultimate result of this crisis will be beneficial to the French industry, for the healthy firms are being caused to amalgamate and to standardize, while the weaklings are being driven out. There are about 80 firms in France engaged in automobile production, each one endeavoring to make a car complete from front spring hanger to tail lamp, with consequent high overhead charges. Some of these firms do not exceed 250 cars a year.

Oakland Changes Policy in New York Territory

NEW YORK, Feb. 28—Marking a new Oakland-Pontiac distribution policy in the New York territory, the Oakland Motor Car Co. has opened a retail store in the new General Motors Building and is appointing direct dealers elsewhere in the Metropolitan territory.

Receivers for H. L. Stratton, Inc., former distributor, are liquidating and last week conducted an auction of office furniture, used cars and equipment.

M. E. Zittlerholm has been appointed assistant district manager for Oakland and has his offices with L. C. Covell in the Fisk Building.

RUBBER SQUEEZER SOUGHT BY EDISON

FORT MYERS, FLA., Feb. 28

—If tests by Thomas A. Edison prove successful, he believes the United States will be able to grow all of its own rubber in southern states. He showed newspapermen over a three-acre rubber tract on his Florida estate and outlined plans for a machine which will squeeze the juice from rubber vines and reduce labor costs. He is working also on a reaper to cut rubber producing vines.

He said he was working with Henry Ford on the plan and expressed the hope that he would be able to drive the first Ford equipped with tires made from the domestic rubber before very long.

Mr. Edison believes a hardy rubber vine, now growing on his tract, will grow over the entire portion of the United States south of Savannah. The vine after cutting grows again and can be harvested annually.

Citroen Revises List and Keeps Output High

PARIS, Feb. 10 (by mail)—Price cuts, varying from 2800 to nearly 6000 francs, according to model, are announced by Citroen for all orders registered from Feb. 1. This brings the price of the cheapest Citroen, a four-seater phaeton, with balloon tires, shock absorbers, four-wheel brakes with Servo mechanism, to 20,700 francs. The standard sedan is sold at 23,100 francs, and the luxury model sedan with all-metal body has been dropped from 30,000 to 24,600 francs. Citroen's production is being maintained at 220 a day, this including units for assembly in foreign plants.

Nash Has Automatic Honer

KENOSHA, Feb. 26—The Nash Motors Co. announces that one of the latest improvements in its manufacturing plant is a machine which automatically hones all of the seven main bearings and six connecting rod bearings on the crankshaft at one time, giving these bearings a mirror-like finish with a degree of consistent accuracy which was unattainable by hand. The machine revolves about the crankshaft and has a rotary reciprocating motion. When the operation is completed the machine automatically stops.

Graham Shipments Gain

DETROIT, Feb. 26—More trucks and commercial cars were made and sold by the Graham Brothers division of Dodge Brothers, Inc., in January, than in the same month for any previous year. Shipments totaled 4255 compared with 3765 in January last year. Production is now 275 units a day.

Timken Axle Shows Increased Profits

Gain of Approximately \$400,000 Shown Over 1925 Total
—Assets Ratio 7.3 to 1

DETROIT, Feb. 26—The Timken-Detroit Axle Co. for the year ended Dec. 31, 1926, had net profits aggregating \$1,772,460, after depreciation and Federal income taxes, the annual statement reveals. This equals 18 per cent on the outstanding par value common stock, after allowing for dividends on the preferred stock and compares with net profits of \$1,382,065 in 1925, or 13.1 per cent on the common.

Preferred stock dividends paid totaled \$284,237 and \$558,391 was paid on the common stock, leaving \$901,082 for transfer to surplus, bringing the total surplus to \$2,669,673. Sinking fund requirements of the preferred stock were complied with by the purchase and retirement of preferred stock of the par value of \$159,200.

The Timken-Detroit Axle Co., and its subsidiary, the Timken-Detroit Co. consolidated balance sheet shows total assets of \$16,445,979, compared with \$15,515,734 at the close of 1925. Current assets aggregated \$8,408,746, including \$826,909 in cash and \$2,033,933 in certificates of deposit. Current liabilities were \$1,152,208, a ratio of approximately 7.3 to 1. Net working capital is listed as \$7,256,537, a net increase of \$500,490 over the working capital available at the end of 1925. The company closed the year without bank loans and with no funded indebtedness, nor contingent liabilities.

Plant assets are accorded a valuation of \$6,181,607, after writing off \$4,284,555 in reserves for depreciation of buildings, machinery and equipment, this being an increase from \$5,900,870 at the close of 1925.

Investments total \$1,031,851, comprising holdings in the Timken-Detroit Realty Co. The sinking fund representing preferred stock purchased for retirement was \$186,893. Deferred items amounted to \$180,449.

At the close of 1926 the outstanding preferred stock was \$4,307,100 and outstanding common stock \$8,239,200 with surplus of \$1,768,590, making a total of \$14,314,890. Reserves totaled \$202,747.96, according to the statement.

Sterling Gets Big Order

MILWAUKEE, Feb. 26—The Sterling Motor Truck Co., Milwaukee, one of the oldest exclusive builders of commercial vehicles in this country, has just booked one of the largest export orders in its history. It is from a South American mining company and calls for 52 Sterling trucks and bus chassis, for use in the Argentine. The order is valued at approximately \$157,000 and was placed through the Sterling company's export offices in New York.

Mack Holds Net Near 1925 Total

Slight Decline Results From Conservative Policy on Time Sales

NEW YORK, Feb. 26—Despite the new policy concerning time sales adopted by Mack Trucks, Inc., in July of last year, net profit for the 12 months showed only a slight decline from 1925, totaling \$8,852,453 after depreciation and Federal taxes, against \$9,468,269 in the previous year. The 1926 net was equal to \$10.81 a share on 713,434 shares of no par common outstanding, comparing with \$13.62 a share on 611,515 shares in 1925.

Commenting on the report, A. J. Brosseau, president, says:

"Sales in 1926 were \$69,032,203 against \$68,912,183 in 1925. Attention is called to the excellent financial condition of the company with net quick assets amounting to \$50,907,730, and particularly to the reduction in notes payable, the total of which as of Dec. 31, 1926, amounted to \$1,805,000, as compared with \$15,743,500 on Dec. 31, 1925. As the \$1,805,000 has been retired since the end of the year, the company now enjoys the position of being entirely without bank loans or discounted customers' paper."

Because of the better class of business taken since July, 1926, and the payments on sales previously made, and the repossession of trucks from buyers who were unable to pay, the notes and obligations now held by the company are of high quality and no losses are anticipated or expected.

"Operations for 1927 have been carefully budgeted. Expenses will be materially reduced and many economies will be effected. In the event the anticipated volume of business is secured the operations for the year should be very satisfactory."

Current assets of the company as of Dec. 31, 1926, were \$57,363,853, against \$56,524,873 at the end of 1925, and current liabilities were \$5,071,423, against \$21,401,080, now standing in a ratio of 11 to one against a ratio of three to one a year ago. Total assets are \$83,021,639, against \$85,164,546 at the close of 1925. Cash dividends paid in 1926 amounted to \$5,113,903.

Mexican Duties Change

WASHINGTON, March 1—Changes in import duties on 350 items of the Mexican customs tariff will become effective March 7, according to advices received this week by the Department of Commerce from its attache at Mexico City. Most of the changes are increases, including the rates on automobile inner tubes, metal manufactures, batteries weighing not more than 100 kilos each, and battery plates. Heavy batteries continue duty free.

ROLLERS TO STOP CARS AT GRADES?

COLUMBUS, Feb. 26—Charles Burnett, an inventor of Washington Court House, thinks he has solved the problem of safety at grade crossings by means of an invention upon which he has applied for a patent. His invention consists of a series of rollers on either side of the crossing so arranged that each vehicle runs on the rollers. These are to be placed from 20 to 40 feet from the tracks, or in other words there will be 20 feet of the road surface covered by the rollers.

Usually these are stationary but the gears can be released by the crossing watchman, or by an electrical device controlled by an approaching train and thus overcome the traction of the automobile wheels.

Mack and ACF Obtain New Jersey Bus Order

NEW YORK, Feb. 28—Of an order for 212 new buses placed by the Public Service Transportation Co. of New Jersey, 147 will be built by the Mack International Motor Truck Co. and 65 by the American Car & Foundry Motors Co.

Of the Macks, 40 will be of the gas-mechanical type and 70 of the gas-electric type with four-cylinder engines and one electric motor, and 37 will have six-cylinder engines and one motor.

The electric equipment of the 107 cars will be manufactured by the General Electric Co.

The company will use 125 of the new buses to replace vehicles retired because of wear obsolescence, 47 will be for use on new routes or lines and 40 will be put into the chartered bus service in which the company is now specializing.

White Lowers Two Prices

CLEVELAND, Feb. 26—The White Co. this week reduced prices about 28 per cent on two models. Model 15, three-quarter and one-ton truck is reduced from \$2150 to \$1545 and the Model 20, one and one-half ton capacity is reduced from \$2950 to \$2125. Walter C. White, president, says the increasing demands for light trucks and production economies in the plant have made the reductions possible.

Navy to Buy 800 Tires

WASHINGTON, March 1—The U. S. Navy will order approximately 800 automobile tires and an equal number of tubes for automobiles in use at Navy Yards and stations for the period from April to June, it was announced here this week by the Navy Department. These materials will be included in the general supply committee contracts covering general needs of the government departments.

Chandler-Cleveland Shows \$401,329 Net

Change in Body Supply Results in Reduced Shipments, President Says

NEW YORK, Feb. 28—Chandler-Cleveland Motors Corp. for 1926 reports net profit of \$401,329 after depreciation, Federal taxes, etc., equivalent to \$1.11 a share earned on 350,000 no par shares of \$4 preferred stock outstanding. Total income was \$4,533,477; expenses, depreciation, etc., \$4,097,148 and Federal taxes \$35,000. Balance sheet as of Dec. 31, 1926, showed cash \$432,837 against \$3,036,917 as of Nov. 30, 1925; notes and accounts receivable \$252,739 against \$792,158 and inventories \$4,821,430 against \$4,531,090. Notes payable were \$703,897 against \$194,686; accounts payable \$1,252,326 against \$3,420,650.

President F. C. Chandler, in his remarks to stockholders, says:

"The earnings for the year were disappointing, but this was largely due to the fact that during the first six months, which should be the period of best earnings, our sales were unsatisfactory. This was accounted for largely by the unfortunate change we made in the fall of 1925 for the supply of our bodies. Had it not been for this our shipments during the first six months would doubtless have been 6000 to 7000 cars greater. However, by the first of August the situation had been remedied, and car sales since that time have shown a marked improvement.

"The total number of cars sold in the first six months was 10,623 and in the last six months 10,248, a total of 20,971 cars. Had the business for the first six months been normal, the showing for the year would have been decidedly different.

"During 1926 we developed, at a large expense, all of which expense was absorbed, the new Royal eight, Chandler. Its reception by both dealers and the public was quite beyond our expectations, and orders for this and our other models since the first of the year have been greatly in excess of those of a year ago.

"Judging from the response already received in the way of orders and the reports that we have from our dealer organization, it looks as though 1927 will show a substantial increase in the volume of our business over that of 1926, and a consequent betterment in the way of earnings."

India Tire at Capacity

AKRON, Feb. 28—Peak production of the India Tire & Rubber Co. was reached last week. With the completion of new buildings which are under construction at the present time, manufacturing facilities will be increased. Orders on hand call for capacity production for the next 60 days.

Men of the Industry and What They Are Doing

Hinkley Vice-President of Brake Materials Unit

Following the location of its factories in Detroit, the American Brake Materials Corp. has announced that C. C. Hinkley will be associated with the company as vice-president in charge of manufacture. The appointment of Percy Owen as president was announced last week.

Mr. Hinkley is widely known in the industry. As president of the Hinkley Motors Corp. he was connected with the engine building branch of the industry for many years and has had an active part in many of its association activities. He recently sold his interest in the Hinkley company.

The board of directors of American Brake Materials Corp. has as its chairman J. B. Terbell, president of the American Brake Shoe & Foundry Co. Other members are J. S. Thompson, W. F. Cutler, T. Finigan, W. B. Given, Jr., and W. S. McGowan, all officers of the parent company.

Overman Joins Spicer

Phil N. Overman has joined the sales organization of the Spicer Mfg. Corp. and will have his headquarters in the Detroit office of the company in General Motors Building. Mr. Overman is resigning from the sales staff of the Hyatt Roller Bearing Co., to accept the Spicer position. He had been a member of the Hyatt organization for eight years, latterly in the Detroit office. Mr. Overman has been very active in the affairs of the Detroit Section of the Society of Automotive Engineers.

Porter Now Vice-President

Robert W. Porter, general sales manager of the Splitdorf Bethlehem Electrical Co., has been elected vice-president in charge of sales. Walter Rautenstrauch, president, reports that commitments on 1927 business are in advance of 1926. He announced an annual saving of \$200,000 as the result of improved manufacturing methods.

Krohn on Western Trip

Henry Krohn, vice-president of Paige-Detroit Motor Car Co., has left for an extended trip covering the principal dealer points of the West. He will visit the Los Angeles automobile show and will also visit Denver, San Francisco, Portland, Seattle, Spokane and Salt Lake City.

Archer Names New Heads of Ternstedt Departments

DETROIT, March 1—Thomas P. Archer, president of Ternstedt Mfg. Co., today announced a complete list of appointments to fill vacancies caused by resignations of Ternstedt executives who are going to Yellow Truck & Coach

Co., with Paul W. Seiler, recently named president. The appointments follow: Frank M. Edgar, formerly chief engineer becomes vice-president and general factory manager; J. Leonard Frey, formerly comptroller, is made treasurer; W. C. Dandeno, formerly manager of the cost department, becomes assistant treasurer; E. W. Sturgeon is made director of purchases; A. J. Sana, chief engineer, Mernell A. Phillips, manager of the cost department, and Roy H. Sullivan, formerly vice-president of the North & Judd Mfg. Co., also methods engineer for Yale & Towne Mfg. Co., has been named special consulting engineer.

Salesmen Hear Moskovics

F. E. Moskovics, president of Stutz Motor Car Co. of America, Inc., addressed Los Angeles retail salesmen just before the opening of the automobile show there. He said the coming four years would see more technical changes made in automobiles than have been made in the past 10 years.

Hupp Officers on Trip

DuBois Young, president and general manager of Hupp Motor Car Corp. and Frederick Dickinson, advertising manager and assistant sales manager, are spending a month in the West visiting various distributing points. Among the cities they will visit are Spokane, Seattle, Portland, San Francisco and Los Angeles. They expect to be gone a month.

DuPont Names Representatives

N. A. Gibson and C. M. Buitner have been appointed sales representatives of the chemical specialties division of the E. I. duPont de Nemours & Co., Inc., in the Chicago and Pacific Coast territories respectively. M. J. Powers, formerly in the Chicago territory, has been made assistant to the sales manager with headquarters in Detroit.

Gilbert Joins Coast Company

Harry R. Gilbert has been appointed territorial field sales representative for the Watson Stabilator Pacific Co. of San Francisco. Mr. Gilbert is an old Stabilator man, having been engaged in sales and distribution of this well-known product for some years.

Engineers Name Officers

Officers of the Society of Time Study Engineers for 1927 are J. C. Mottashed, Hudson Motor Car Co., president; Harry Ford, Cadillac Motor Car Co., vice-president; A. C. MacClure, Hudson Motor Car Co., secretary and treasurer, and H. Anderson, Chrysler Corp.; J. Gould, Timken-Detroit Axle Co., and the officers above named, members of the council.

Autocar Selects Coale as New Sales Manager

H. M. Coale has been appointed general sales manager of the Autocar Co., succeeding R. P. Page, Jr., recently elected president. Mr. Coale is a vice-president of the Autocar Sales & Service Co., the subsidiary which operates the Autocar system of factory branches. He has been a member of the Autocar organization for several years; recently as manager of the central sales district with headquarters in Philadelphia. Mr. Coale is a graduate in engineering of Cornell University and is widely known in the automotive industry.

Wentzel in New Post

Albert E. Wentzel, formerly service manager of the Watson Stabilator Co. of Philadelphia, has taken over his new duties as factory service representative for New England. He succeeds Joseph Kuzman in that territory, Mr. Kuzman now having charge of factory service in New York and eastern Pennsylvania.

Chrysler Names Sales Aides

George E. Clarke and F. K. Russell have been appointed assistant directors of sales of Chrysler Sales Corp. Both men are well known in the automotive sales field, their experiences dating back over several years. Mr. Clarke has served as manager of the Overland branch in Detroit for several years.

G. L. Masters Promoted

G. LaRue Masters has been promoted to assistant general sales manager of the National Lock Washer Co., Newark, N. J. He has been connected with the company for the past six years.

Shop Equipment Credit

Not Arranged by Olds

LANSING, March 2—Olds Motor Works is not extending direct credit to all Oldsmobile dealers on the purchase of special tools and equipment for use in the program of the service promotion department of that company, according to a statement by T. H. Stambaugh, service promotion manager.

"The distribution of Oldsmobile special tools and equipment for service use is being made through a number of automotive jobbers located in various parts of the country. There have been some wrong impressions gained throughout the trade relative to this Oldsmobile program as to the credit facilities put in the hands of Oldsmobile dealers. The credit extension to Oldsmobile dealers is directly an arrangement of the selected jobbers and Oldsmobile dealers. These credit facilities and the availability of tools near to Oldsmobile dealers are two of the salient elements of advantage to dealers in our jobber distribution of special tools and equipment."

Industry Praises Work of Clifton

(Continued from page 381)

chamber and the business in general has been for the good of all.

R. B. Jackson, president, Hudson Motor Car Co.: Colonel Clifton's retirement from the presidency of the National Automobile Chamber of Commerce brings a sincere sense of loss to all of us. His policy has been consistently constructive and always highly ethical. Such leadership is rare and the results obtained during his long years of service should afford Colonel Clifton the real satisfaction of a work well done.

H. M. Jewett, chairman, Paige-Detroit Motor Car Co.: His wonderful vision of the possibilities of motor transport has always guided the actions of the chamber along progressive and sound lines and we shall miss his wise counsel, but the foundation which he so solidly built will carry and always be a monument to a great man.

A. J. Brosseau, president, Mack Trucks, Inc.: Under his wise leadership the industry by means of unselfish mutual helpfulness and mass effort has developed into the world's greatest business and has rendered successful service to mankind.

C. D. Hastings, chairman, Hupp Motor Car Corp.: His influence has always been constructive and to it must certainly be given the credit for many of the reforms and customs which have proved so successful. As a harmonizing element in so highly a competitive business he has been a tower of strength.

F. E. Moskovics, president, Stutz Motor Car Co. of America, Inc.: No small part of the progress of this industry is due to Colonel Clifton's guidance, calmness and tranquillity during periods of storm and stress.

C. W. Nash, president, Nash Motors Co.: He has been a great leader and organizer. He has cemented organization together as no other man could have done.

F. C. Chandler, president, Chandler-Cleveland Motors Corp.: I feel that he has accomplished so much more than any other man in the industry could have done in holding together in harmony and good fellowship this great association.

W. T. White, chairman, The White Co.: He has consistently been the outstanding leader of this industry which under his direction today ranks first among the great industries of this country.

F. J. Haynes, chairman, Dodge Brothers, Inc.: His most pleasing personality, complete knowledge of the industry's problems, his tolerance for all, his good and farsighted judgment as well as his always unwavering adherence to justice were a most powerful influence in establishing the high standards of business, fair play and justice that characterize the world's greatest industry.

A. R. Erskine, president, Studebaker Corp.: The great progress of the industry and the prosperity and happiness it has brought the nation, and into the lives of countless millions, have accrued under Colonel Clifton's watchful eye and sympathetic contribution.

R. E. Olds, chairman, Reo Motor Car Co.: Colonel Clifton's long connection and untiring service have been appreciated by us all. I value highly our years of friendship as well as our business association.

W. P. Chrysler, president, Chrysler Corp.: Colonel Clifton's long influence in the world's greatest business has resulted in mass prosperity.

Alvan Macauley, president, Packard Motor Car Co.: Colonel Clifton took office when the industry was new, unorganized, and antagonistic. By patient, considerate, and thoughtful direction he brought the many diverse factions together into an organization that for more than twenty years has directed the industry along lines of mutual helpfulness and accord, and has been to all the world an example of the benefits of cooperative effort.

E. S. Jordan, president, Jordan Motor Car Co.: May the men who guide the future destinies of the greatest business in the world always be guided by that broad spirit of tolerance and friendly helpfulness with which Colonel Charles Clifton inspired our industry.

John N. Willys, president, Willys-Overland Co.: He has been a great believer in mass salesmanship as well as mass production.

W. E. Metzger, vice-president, Federal Motor Truck Co.: Colonel Clifton has in his twenty-two years' leadership proven to be the greatest of industrial leaders and the automobile industry will suffer a distinct loss through his retirement.

Incoming President Has Noted Career

(Continued from page 381)

the engine repair and tire repair work himself, which in those days was a very considerable task.

He was one of the initial sponsors of the Lincoln Highway, and later was among the first to see the need for a Federal highway. Along with the late Amos G. Batchelder, he was one of the first proponents of the present Federal Highway Act, which requires that all interstate roads shall be built on the basis of their economic necessity, and that a part of all Federal highway funds shall be set aside for maintenance.

He was chairman of the Highway Transport Committee of the Council of National Defense during the war.

In recognition of his services to the study and knowledge of highway transportation, he received in 1922 the degree of Master of Arts from the University of Michigan.

American Chain Buys Window Lift Patents

NEW YORK, March 3—Continuing its policy of expansion, the American Chain Co. has acquired the patents of the Rawlings Co. of America and will manufacture the Rawlings line of window lifts. Carl Rose, formerly president of the Rawlings company has been made manager of the window lift division of American Chain and is getting out improved models.

This new move by the American Chain followed closely the acquisition of patents to passenger car rights of the Rubber Shock Insulator Co. The American Chain has started manufacture and sale of this product under Wilder Gutterson, formerly with the Rubber Shock Insulator Co.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, March 3—Trade remained in somewhat restricted volume last week, although basic industrial operations continued to expand moderately. Commodity prices in general moved further downward, while stock quotations advanced. Money rates were virtually at the same level as in the preceding week.

FREIGHT CAR LOADINGS

Railway freight car loadings in the week ended Feb. 12 numbered 968,317, which compares with 970,892 a week earlier and 917,625 a year ago. The increase over last year's figure is almost entirely due to the gain in loadings of coal.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended Feb. 23 (a holiday week) were 12.3 per cent smaller than the total for the preceding week but 9.2 per cent above that for the corresponding period last year.

FISHER'S INDEX

Fisher's index of wholesale commodity prices stood at 141.4 last week, as against 142.1 a week earlier and 145 four weeks earlier. The stock price index advanced to 182.3, the highest average of the year to date, which compares with 179.5 for the preceding week.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks declined \$40,000,000 during the week ended Feb. 23, with a gain of \$1,500,000 in discounts and declines of \$34,800,000 in open market purchases and \$6,600,000 in holdings of Government securities. Note circulation increased \$22,900,000, while deposits declined \$127,700,000 and reserves \$17,000,000. The reserve ratio rose from 78.4 to 80.1 per cent.

During the same period, loans of reporting member banks increased \$23,000,000, loans secured by Government obligations declining \$2,000,000, while loans secured by stocks and bonds increased \$17,000,000 and "all other" loans \$8,000,000. Investments increased \$11,000,000, borrowings from the Federal Reserve banks \$1,000,000 and time deposits \$53,000,000, while net demand deposits declined \$121,000,000. For the first time in seven weeks, there was an increase, amounting to \$44,000,000, in loans to brokers and dealers made by reporting member banks in New York City.

The call loan rate ranged from 3% to 5 per cent last week, as against 3% to 4½ per cent a week earlier. Rates on time loans were unchanged at 4% to 4½ per cent and commercial paper rates at 3% to 4% per cent.

Steel Orders Cover March Operations

Stiffening in Prices Noted With Backlogs Mounting to Higher Levels

NEW YORK, March 3—Several good-sized orders for full finished automobile sheets have been placed in the last few days and makers of black sheets have also received gratifying additions to their backlog from automotive consumers. Mahoning Valley finishing mills have sufficient business on their books to carry them comfortably through the current month and, in a few instances, some weeks beyond that time.

Following some very good buying of hot-rolled strip steel by automotive interests on a 2-cent base, 2.10 cents has become the asking price of some producers, but so far this higher price level has not been sufficiently tested in actual sales. Cold-rolled strip steel is selling at from 2.80 cents base upwards, small quantities commanding up to 3.25 cents, Pittsburgh. The market for hot-rolled strip steel has undoubtedly begun to recover some of the ground it lost in the forepart of February as result of intensive competition.

Cold-rolled strip steel is also showing signs of more steadiness. Hot-rolled steel bars are holding firm at 1.90 cents, Pittsburgh and Youngstown, and cold-finishing experience somewhat more delay in getting their supply of hot-rolled material. Automotive buying of cold-finished steel bars has broadened, and the market has gained in firmness, with 2.40 cents, Pittsburgh, the uniform quotation. A new price card for bolts and nuts is to become effective April 1.

Automotive alloy steel makers have added further to their order reserve and operations are now at a better rate than they have been in some time. There is no question but that the last few weeks have brought a decided improvement in steel demand, with the automotive industries leading all other classes of consumers. James A. Campbell, president of the Youngstown Sheet & Tube Co., has declared his belief that the steel industry will be able to do about 90 per cent of the business of 1926 in 1927.

Aluminum—The market is fairly active, with prices entirely unchanged. Broader interest in light aluminum alloys is developing. Remelted metal is in good demand.

Copper—Curtailment in production is the talk of the day, but the market seems to be slowly recuperating from its recent depression, and may be in a fairly satisfactory condition long before the effect of an artificial cutting down of output would be felt.

Tin—Seventy-cent tin has little appeal for consumers who buy only what they can not do without.

Lead—Storage battery manufacturers are showing somewhat more interest in the market.

NEWSPAPER SPURS USED CAR SALES

MILWAUKEE, Feb. 26—Parry B. Smith, salesman for the Holmes Motor Co., Ford dealer, won a gold strap watch offered by the Wisconsin News, one of the leading daily papers of Milwaukee, by selling the largest number of used cars in a contest of two weeks' duration in which more than 100 salesmen participated. Mr. Smith sold 40 used cars of various makes, defeating his nearest opponent by 12 cars. Twenty-six were sold during the first week, which was during the annual Milwaukee show.

Crucible Steel Offers New Tool Alloy Steel

CLEVELAND, March 1—At a sales convention in the Hollenden Hotel, A. T. Galbraith, vice-president of the Crucible Steel Co., announced that his company has brought out a new alloy steel with extraordinary resistance to wear. It is known as H. Y. C. C. steel and will be used in punches, dies and armatures and similar equipment where extreme accuracy is demanded. The new steel, it is claimed, will enable machine shops to turn out hundreds of thousands of automobile parts without changing the tool, where it was formerly necessary to replace bits about every 10,000 pieces.

Frank E. Phelps, manager of the Cleveland office of Crucible, predicts that the new alloy will replace the present tool steel as high speed metal replaced the old carbon steel.

Makes Non-Corroding Terminal

GALVA, ILL., Feb. 26—The Great Western Patent & Mfg. Co. is producing a new non-corroding battery terminal for storage batteries after 27 months' test of the new terminal. The lug is harder than the battery post and the terminal is of a new amalgamation against corrosion. Dr. George Barger, president of the company, says the terminal has not shown signs of corrosion during the test which has continued over two years.

To Push Sport Roadsters

CLEVELAND, Feb. 26—According to C. A. Tucker, general sales manager of the Peerless Motor Car Co., his factory will turn out more sport models than ever this year. Mr. Tucker says that the sport roadster body will be found on every type of chassis that Peerless makes. He says the popularity of the sport roadster will never wane.

Falcon Plans 50 Daily

DETROIT, Feb. 26—When Falcon Motors Corp. starts production in its factory at Elyria, Ohio, March 15, a schedule of 50 cars a day will be maintained throughout the month.

Paige Reports Net of \$500,206 in 1926

Reduction From \$2,437,865 in 1925 Attributed to Body Supply Interruption

DETROIT, Feb. 26—Net income of Paige-Detroit Motor Car Co. for 1926 was \$500,206 against \$2,437,865 for 1925, equivalent, respectively, to 54 cents and \$3.83 a share earned on the 674,474 shares of common stock after preferred dividends. Sales were \$36,857,484 last year against \$62,763,787 in 1925.

Surplus after dividend was \$368,999 against \$1,379,494 in 1925. The lowered net is attributed to interruption in body supplies during the peak of the buying season, increasing the cost of bodies and necessitating the discarding of all body dies before they were fully amortized.

"Notwithstanding this, the financial condition of the company has been well maintained," President H. M. Jewett said in his annual report. "On Dec. 1, 1926, \$500,000 of the \$1,000,000 debentures outstanding were paid. Of the remaining \$500,000 still outstanding, the company has purchased and holds \$252,000 in its treasury. In accordance with the sinking fund requirements, \$247,800 of preferred stock was acquired. Current liabilities were reduced nearly \$800,000 during the last quarter and at the close of the year the ratio of current assets to current liabilities was in excess of 2.3 to 1."

State Legislatures Get 1700 Automotive Bills

NEW YORK, Feb. 26—Record-breaking activity in state legislatures this season in the introduction of bills affecting the automotive industry is reported by local observers. Since the first of the year about 1700 bills of this nature have been brought up for consideration in 42 states. In 19 states there are proposals to increase the gasoline tax and two are considering establishment of a gasoline tax, according to the figures of the National Automobile Chamber of Commerce.

As a result of the campaign against compulsory insurance now being waged, it appears that there are only two states, New Jersey and Pennsylvania, in which there is any real immediate danger of passage of compulsory insurance laws. Even in these two states it is likely that the measures will be disapproved.

W. H. Stanley

CHICAGO, Feb. 26—W. H. Stanley, who was manager of the catalog department of the Automotive Equipment Association, died Feb. 21, at Ft. Wayne, Ind. Funeral services were held Feb. 23 in Leesburg, Ind., the home of the family.

Balloon Tire Sizes Reach Total of 36

Original Equipment Specifications Call for 28—See Standardization Need

AKRON, March 1—The automobile tire industry is faced with a still greater multiplicity of sizes as a result of the phenomenal growth in popularity of balloon tires within the past three years. Authorities declare there is an imperative need for standardization.

With balloon casings now standard equipment on practically every known make of automobile and upon many makes of buses and trucks, there are 36 balloon tire sizes, compared with five three years ago. Original equipment specifications of passenger car manufacturers call for 28 different sizes, besides eight different sizes required in heavy duty balloon tires for commercial vehicles.

Balloon tires are made today as small as a 27 x 4.40 and as large as a 38 x 9.

Three years ago, out of total tire production in the United States, balloon tires represented 11.43 per cent. In 1925 balloon tires made up 34.22 per cent. Last year balloon tires represented 47.57 per cent of total output.

Within the past few months several large rubber manufacturers have announced improvements in construction and tread design of their balloon tires made to give increased mileage and service to the consumer.

The Goodyear Tire & Rubber Co. is reported to have spent \$4,000,000 in research, changing molds and advertising in connection with its new "All Weather" tread balloon tire. Miller Rubber Co. officials announce that \$2,000,000 has been expended on the development of the new "one-piece construction" semi-flat tread balloon casing. Lee and several smaller companies also have brought out new tires of this type.

The tendency toward balloon tires of small rim diameter, noticeable since the introduction of the small, European type of car, has resulted in the standardization of ten new tire sizes of the "sub 20 inch" size, according to Miller tire men. Eight months ago there was only one tire size of rim diameter less than 20 inches.

The actual sectional width is no less and the type of construction is just as heavy as in tires of larger rim diameter. The change is merely in the direction of the rim they will fit.

Complete Road Dust Study

WASHINGTON, Feb. 26—The U. S. Bureau of Standards has just completed a series of laboratory experiments to determine the effect of road dust on the lubricants of automobiles, it was announced this week, the investigations involving a study of the per-

formance characteristics of journal bearings.

Under severe operating conditions, the study shows, road dust in the lubricant of an automobile will considerably increase frictional losses. At very light loads, however, there is but little difference. The difference in friction increases, with the presence in the lubricant of an abrasive dust, as the severity of operating conditions is increased.

Seek Reorganization of Billings-Spencer

HARTFORD, CONN., Feb. 26—A meeting of the bondholders of Billings & Spencer Co. was held this week to devise ways and means of bringing about a reorganization of the capital structure. A committee of three, L. Edmund Zacher, Benedict M. Holden and James H. Brewster was appointed to study the condition of the company.

It was suggested that interest charges on the outstanding bonds be waived for several years, that the rate of interest be reduced from 7 per cent to 5 per cent, that an issue of 120,000 shares of no par value stock at \$5 a share be made, with first rights given the preferred stockholders and that an issue of prior stock be made of 66 2/3 per cent of the notes, the banks to carry the balance of the loans without interest.

A survey recently made showed that the company can earn consistently from \$150,000 to \$200,000 which is ample for interest charges and reasonable dividends. During 1926, the Billings & Spencer Co. did a business of \$2,000,000.

Wilson Company Progresses

MOLINE, Feb. 26—The E. H. Wilson Mfg. Co., operating under receivers, is gradually returning to full production and will soon be out of the difficulties of reorganization. The company has orders to assure operation through the summer. E. O. Douglas has been added to the staff as factory operations superintendent and A. J. Smith continues as general foreman. Activities of the operators are centered on establishing the business on a paying basis and plans for reorganization have been temporarily held in abeyance.

Makes Windshield Screen

DETROIT, Feb. 26—The Albion Metal Products Co., capitalized at \$15,300, has been organized at Albion to manufacture windshield safety screens, the invention of E. B. Clement, of Jackson. The company expects to start production April 1 with a schedule of 25,000 for the first year.

Olds Sales Gain 32%

DETROIT, Feb. 26—According to Olds Motor Works executives, the sale of Oldsmobiles during January and February exceeded the same months of 1926 by a comfortable margin. February sales are reported to have shown an increase of 32 per cent.

Financial Notes

General Motors Corp. final report for the year ended Dec. 31, 1926, as filed with the New York Stock Exchange, shows net income after charges and Federal taxes of \$176,085,144, excluding equity in undivided profits of subsidiaries, and compares with \$106,484,756 in 1925. Net income after charge and Federal taxes, including company's equity in earnings of subsidiaries was \$186,231,182, equivalent after preferred and debenture dividends to \$21.80 a share on the average amount of common stock outstanding during the year.

B. F. Goodrich Co. and subsidiaries for year ended Dec. 31, 1926, showed net profit of \$5,065,110 after taxes, depreciation, interest, etc., and after crediting income amount with a contingency reserve of \$5,000,000 set up in previous years. If this reserve is excluded, actual results for 1926 show earnings of \$65,110.

Net sales for the year of the parent company and its subsidiaries amounted to \$148,391,478, as compared with \$136,239,526 for the corresponding period of 1925.

Lake Erie Bolt & Nut Works shows net income of \$167,551 and in 1926, after initial dividends, \$152,551 was transferred to surplus. This was equal to \$2.54 on 60,000 shares of common stock, compared with \$2.20 in 1925. Current assets exceed current liabilities by six to one. The company shows \$50,633 cash and certificates of deposit compared with \$7343 cash one year ago. Inventories are \$107,500 lower, while liabilities are \$80,597 lower.

Miller Rubber Co. reports for year ending Dec. 31, 1926, net profits, after all charges of \$1,025,454. Regular dividends of \$983,568 were paid on the preferred during the year; \$520,182 on the common, and \$827,000 in preferred shares retired. Net addition to the plant account was \$1,783,331, and for current year's depreciation of the plant \$1,044,392 was charged off.

Foot Bros. Gear & Machine Co. reports net profit for the year ended Dec. 31, 1926, as \$224,926, which, after allowing for sinking fund requirements and dividends increased the surplus to \$391,742. Current assets of \$819,235 are shown as against current liabilities of \$174,138. The company has established a fund to purchase preferred stock in the sum of \$22,492.

Gabriel Snubber Mfg. Co. declared the regular quarterly dividend of 87.5 cents a share, payable April 1 to stock of record March 12. This action followed the annual meeting at which directors and officers were reelected. Business for the first quarter will exceed that of the same period in 1926, executives say.

Norwalk Tire & Rubber Co. reports for quarter ended Dec. 31, 1926, net loss of \$63,895, after expenses and depreciation, etc., comparing with net profit after Federal taxes, of \$95,421, in the 1925 quarter.

Midland Steel Products Co., for the year ended Dec. 31, 1926, shows net profit of \$1,748,611 after interest depreciation, Federal taxes, etc. This compares with \$2,724,773 in 1925.

February Sales Show Marked Improvement

(Continued from page 380)

both new and used cars much larger in February and report the outlook for March business as favorable. In several centers retail sales are expected to run as large in the first quarter as in the first quarter of 1926. General business conditions are reported good in most sections and the special conditions affecting the automobile business are improving.

Reports from leading centers follow:

NEW YORK

Car sales in the metropolitan distributing area picked up considerably during the first half of February. Actual sales in the first two weeks were 1951 vehicles against 1616 in the same two weeks of 1926. Although the storm in the third week brought a temporary halt to active buying, it is believed that the total for the month will be approximately on a par with February of 1926. As Ford sales were still under last year's level, the gain for most of the other companies was most pronounced.

Although used car stocks are heavier than they were last year, fine progress has been made toward cleaning up the surplus and a distinct revival of interest in used cars is noted by most of the dealers, some of them declaring that there is more inquiry for used cars than for new.

Commercial activity is on a high level and most manufacturing industries in the district are at a good seasonal rate of production.

BOSTON

Motor car sales have taken a decided upward curve and the depression is now disappearing. On Washington's Birthday the thousands who flocked to automobile row comprised about 95 per cent real prospects and buyers, and several hundred new cars were sold, also many used cars.

Outside dealers are in much better shape and they now are ordering cars. The stocks of used cars have been depleted all along the line until in a number of places compared to a year ago the stocks today are about 25 to 30 per cent. There is an optimistic feeling now with show coming on, the holiday being a real barometer, many dealers think, although some of them are wondering if it is not going to be a "shot-gun" season—just one good bang for a few months, and then be over.

ATLANTA

Automobile sales were about the same as in February last year, but the percentage of repossessions is showing an increase, particularly in rural districts, due to low cotton prices. Distributors agree that at least normal spring business is in prospect.

NEW ORLEANS

A survey of the automobile situation in New Orleans, indicates a drop in sales of new cars of about 13 per cent, as compared with January and a drop of about 5 per cent over the same period of last year. There seems to be slightly more used cars on hand now than last month. Also more than the same time last year. Local advertising has helped to stimulate Ford sales, but the showing is about 15 per cent less than sales of last month, and about 8 per cent less than sales of last year. Due to the adverse conditions of the cotton and sugar cane situation in this state, there is a general business depression.

DETROIT

Automobile sales throughout the southern portion of Michigan are steadily on the increase, and February will show a comfortable gain over January. Scattered reports indicate that the demand for used cars is also picking up. Increased employment and good weather is making the business outlook for both new and used cars much better.

CLEVELAND

Automobile distributors and dealers report February business in excess of expectations. The post-show season was one of decided activity and February sales are expected to show an increase over February of last year. General business in the Cleveland district has not been equally good and the automotive business has picked up ahead of other lines. Good weather following the show made possible ready closing of the many prospects. Ford business shows a slight shrinkage in comparison with the total.

CHICAGO

New car sales in February ran comfortably ahead of the January total but fell below the mark reached in February, 1926. The lower level of sales is in harmony with general business conditions. Most business lines have been off but there are signs now of toning up. Car sales have been picking up for the past two or three weeks. Trade reports indicate a marked improvement recently for Ford sales. The used car situation is being relieved only in spots, the big movement of used cars not yet having started.

MILWAUKEE

Aided by the general improvement in business conditions and the more optimistic public attitude, the Milwaukee and Wisconsin passenger car trade experienced a February demand quite above expectations. Total sales fell somewhat below February, 1926, but as for several months past, the decline in Ford sales accounted for the decrease. The outlook for March is favorable. The business situation offers less of apprehension, with industries well occupied and employment gaining. The dealer situation with respect to used cars has been improved by the firmer attitude regarding trade-in allowances. Extraordinary means are being applied to move used cars, with more or less success, but dealers expect the arrival of spring to afford its usual quickening of demand.

ST. LOUIS

There was an improvement in sales of both new and used automobiles during February over the previous month. Sales were about equal to those of February, 1926. Ford sales were considerably under those of last year and Chevrolet gained ground. Other low priced cars also showed to better advantage. The automobile show, concluded February 26, and better weather and business conditions in general, were factors in the improvement of the automotive market. Business conditions throughout showed improvement over January.

MINNEAPOLIS

The automobile business is improving, used car trade is good, the truck business is better. Equipment and accessory business is draggy. The low-priced automobile field is gaining although the February figures showed some decline. The prospec-

tive March business is good. With the gradual restoration of the country banking situation and return of money to circulation through liquidations an appreciable effect in favor of the motor car business is felt.

DALLAS

Automotive business in Texas and parts of adjoining states improved with all other lines as a result of better weather during February. The trade was characterized as normal and the outlook was decidedly better. New car sales were 5 per cent better than January. Many of the sales are replacements. New models stimulated trade. Ford sales below those of same month last year. Used car sales about same as January. Prices are lower and stocks pretty heavy. Truck sales, both of new and used vehicles, were about same as January and for same period last year. Used truck prices are lower.

DENVER

February showed a decided improvement over January, particularly in light cars. This is due in Denver to the show, and to a particularly good month of weather, but the improvement has been manifested all over the state. Light car dealers report about a 25 per cent increase over February, 1926; heavy cars held a little better than even over the same period. Beet sugar districts are optimistic over the renewal of the last year's contracts at the same high price, and the optimism has been reflected in the buying of cars and of tractors.

SAN FRANCISCO

Improvement in general business conditions in central and northern California and Nevada in February was reflected in the movement of new cars which showed an improvement of about 15 per cent over January this year and better than 10 per cent over February, last year. Heavy rains for two weeks acted as strong sales resistance, particularly in small towns and country, but city trade showed marked improvement. Rebuilt used cars selling over \$1000 are moving well. Those selling below this cannot be given away. Ford dealers claim a sales improvement of 12 per cent for February over January.

LOS ANGELES

Notwithstanding two weeks of the heaviest rainfalls southern California has experienced in years, the territory held its own in automobile sales compared with last February, with possibly a slight increase. While some distributors report decreases, a majority report parallel or increased showing. Ford sales are off. Used car stocks are increasingly heavy. The automobile business is ahead of general business, which is considerably slowed by the rains. Truck sales still under expectations, coming below February last year.

SEATTLE

Dealers report lower priced cars will record modest gains over first quarter of last year, but no gain in medium priced cars. The demand for used cars is more active than last year but dealers are being forced to sell them at closer margin. Credit conditions satisfactory. Business conditions in the Pacific Northwest slightly slower but the chief industry, lumber, is expected to get into heavier production shortly. Demand from farming sections has been slow but winter precipitation has been favorable for good crops.

Exports, Imports and Reimports of the Automotive Industry for January of Current Year and Total for Six Months Ending December, 1926

	Month of January		Six Months Ending December					
	1926	Value	1927	Value	1925	Value	1926	Value
Automobiles, parts and accessories.....	Number	\$25,652,547	Number	\$29,141,345	Number	\$159,299,152	Number	\$147,507,031
Electric trucks and passenger cars.....	3	6,678	7	10,785	55	84,286	77	99,022
Motor trucks and buses, except electric.....	5,141	3,730,860	7,713	5,491,542	35,331	22,110,834	31,806	22,744,340
Up to 1 ton, inclusive.....	4,057	1,893,469	5,796	2,691,652	28,411	11,800,327	24,367	11,272,205
Over 1 to 2½ tons.....	888	1,248,994	1,596	1,945,283	5,979	7,363,611	6,324	8,032,365
Over 2½ tons.....	196	588,397	321	854,607	941	2,946,896	1,115	3,439,770
PASSENGER CARS								
Passenger cars, except electric.....	21,167	14,162,692	22,122	15,747,485	126,136	92,092,471	112,132	83,229,678
Value up to \$500, inclusive.....	11,222	4,099,245	9,607	3,377,598	56,468	21,318,184	46,670	18,705,489
Value over \$500 to \$800.....	4,170	3,027,904	5,935	4,084,516	29,432	20,925,645	31,816	21,913,003
Value over \$800 to \$1200.....	4,578	4,834,638	5,070	5,206,735	30,502	32,126,362	25,925	27,288,046
Value over \$1200 to \$2000.....	868	1,311,715	932	1,463,640	7,265	10,939,380	4,859	7,576,909
Value over \$2000.....	329	889,190	578	1,614,996	2,469	6,782,900	2,862	7,746,231
PARTS, ETC.								
Parts, except tires for								
Automobile unit assemblies.....	..	3,183,388	..	2,825,569	..	19,392,576	..	14,500,630
Automobile parts for replacement.....	..	2,830,807	..	3,796,350	..	15,496,591	..	18,405,834
Automobile accessories.....	..	789,339	..	591,615	..	4,473,598	..	4,241,593
Automobile service appliances (n. e. s.).....	..	358,124	..	748,347	..	3,252,295	..	3,269,226
Station and warehouse motor trucks.....	13	7,983	17	21,141	58	57,775	80	86,868
Trailers.....	164	37,042	140	46,883	342	159,976	409	133,521
Airplanes.....	2	14,188	1	19,500	27	290,987	24	179,208
Parts of airplanes, except engines and tires.....	..	25,558	..	22,767	..	19,982	..	51,617
CYCLES, ETC.								
Bicycles.....	385	11,156	245	7,277	3,768	105,831	2,489	67,825
Motor cycles.....	2,230	486,931	1,610	363,512	10,449	2,264,695	9,185	1,997,038
Parts and accessories, except tires.....	..	158,083	..	105,972	..	800,183	..	820,004
INTERNAL COMBUSTION ENGINES								
Stationary and portable:								
Diesel and Semi-Diesel.....	98	125,727	26	148,560	1,031	591,812	460	906,044
Other stationary and portable:								
Not over 10 HP.....	1,805	176,436	2,200	200,174	15,553	1,333,254	17,923	1,813,645
Over 10 HP.....	264	224,016	127	90,276	1,572	1,279,055	1,888	1,640,139
Automobile engines for:								
Motor trucks and buses.....	671	67,118	275	29,151	10,162	919,034	2,380	322,776
Passenger cars.....	9,176	886,665	5,265	648,848	42,006	4,709,762	30,118	3,963,958
Tractors.....	25	17,208	112	48,388	1,155	464,556	1,447	750,470
Aircraft.....	3	16,125	5	42,221	49	111,206	43	145,326
Engine accessories and parts (carburetors).....	..	270,542	..	344,532	..	2,014,850	..	2,022,811
Automobiles and chassis (dutiable).....	83	83,100	34	56,348	406	538,993	477	743,336
Other vehicles and parts for them (dutiable).....	..	1,387	..	5,806	..	450,023	..	98,122
Automobiles (free from duty).....	13	30,903	9	7,160	104	157,063	102	155,670

Packard Reduces Small Six Price

DETROIT, March 1—Packard Motor Car Co. has reduced the price of its small car \$335. The reduction affects all the 126-in. wheelbase six-cylinder automobiles including the five-passenger sedan, five-passenger phaeton and four-passenger roadster. The factory announces that no change has been made in the car itself but that the expenditure of \$8,000,000 for machinery and other plant equipment during the past year has made it possible to increase production and lower costs.

The new prices are: four-passenger roadster, \$2350; five-passenger phaeton, \$2250; five-passenger sedan, \$2250.

Moto Meter Shows Net of \$1,561,973 for 1926

NEW YORK, March 1—Report of Moto Meter Co., Inc., and subsidiaries, excluding National Gauge & Equipment Co., for the year ended Dec. 31, 1926, shows net income of \$1,561,973 after depreciation and Federal taxes. This is equivalent under participating provision of the shares to \$4.66 a share earned on 200,000 no par shares of Class A common stock, and \$3.13 a share on 200,000 no par shares of Class B common. In 1925 net income was \$1,794,592 or \$5.05 a share on Class A and \$3.91 a share on Class B stock.

Net income of \$1,561,973 for 1926, if applied directly to the Class A common stock, is equal to \$7.80 a share on the 200,000 no par shares, comparing

with \$8.97 a share on Class A stock in previous year.

National Gauge & Equipment Co. reports for year ended Dec. 31, 1926, net income of \$300,075 after depreciation and Federal taxes.

Upholstery Companies Combined by Purchase

PHILADELPHIA, March 2—Collins & Aikman Co. has purchased A. T. Baker & Co., Inc., forming a combined capitalization of about \$15,000,000. There was no new financing in connection with the purchase. A. T. Baker will continue as chairman of the board of the subsidiary company, and his place as president will be taken by M. G. Curtis, president of the Collins & Aikman company.

The combination brings together two important manufacturers of closed car upholstering materials. The five mills of the two companies will be continued and increased production and economies are expected, Mr. Curtis said, through the consolidation.

New ACF Bus Ready

NEW YORK, Feb. 28—American Car & Foundry Motors Co. has announced a new 198 in. wheelbase A.C.F. bus chassis with two body styles—a 16-20 passenger parlor car type and a 23 passenger street car type. The new bus is powered with a Hall-Scott six-cylinder engine, with 3 1/4 in. bore, 5 in. stroke which develops 60 hp. at 1800 r.p.m., its governed speed.

Grahams Organize Holding Company

NEW YORK, Mar. 2—The Graham Brothers Corp., an investment and holding company organized this week by the Graham brothers of Detroit, will be interested in concerns closely allied with the automotive industry, it is learned here today although the names of the interests to be acquired are so far withheld.

Capitalization of the new company is \$5,000,000 and general offices will be in New York at 1 East 44th Street, while a downtown office will be maintained at 24 Broad Street.

Directors of the new company will be Z. F. Graham, Joseph B. Graham, Ray A. Graham, John D. Biggers, C. W. Sanford, Alfred G. Wilson and Edwin M. Ashcraft, Jr.

The officers are to be Z. F. Graham, chairman of the board; Ray A. Graham, president; Joseph B. Graham, vice-president; John D. Biggers, vice-president and C. W. Sanford, secretary and treasurer.

Falcon Fixes 2 Prices

DETROIT, March 1—Prices on two of the Falcon Motors Corp. models were announced today as follows: Four-door five-passenger sedan, \$1095; two-door five-passenger brougham, \$995. Prices on the roadster, coupe, touring and landau will be announced later. The company will launch its national advertising campaign in April.

French Engineers Organize Society

PARIS, Feb. 12 (*by mail*)—By a unanimous vote of 400 French engineers united in Paris, it was decided this week to form a Societe des Ingénieurs de l'Automobile, corresponding very closely both in its constitution and its aims to the American Society of Automotive Engineers. It was agreed that the society should occupy itself with aviation engines, leaving airplane construction to an existing organization. M. Rateau, member of the Institute and well-known in connection with aeronautical research work, was elected president and a committee was appointed to make arrangements for the first full meeting and to present a list of officers. The Society has temporary headquarters at 102 rue La Boetie.

In all probability Maurice Goudard, president of the Solex Carburetor Co., who has just returned from a lengthy visit to the United States, will present a paper at the first meeting on the American automobile industry. Arrangements are being made for the French society to take over an existing government laboratory for experimental work.

Paris Show Lifts Ban on Ex-Enemy Exhibits

PARIS, Feb. 10 (*by mail*)—Rules and application blanks for the 1927 Paris Salon, just issued, indicate that this event will be held in the Grand Palais on Oct. 6 to 16 inclusive, and will comprise passenger automobiles and all accessories, to the exclusion of trucks and buses. Applications for space must be filed with the managing committee, 51 Rue Pergolese, Paris, not later than March 31.

Foreign firms having exhibited in three previous shows stand on an equality with French manufacturers in the drawings for position, but this does not apply to American makers, for the clause is still maintained creating an exception for nations having had an

import duty of more than 15 per cent ad valorem prior to the war. The only nation having such a duty is the United States. Ex-enemy nations will be admitted for the first time, and as a consequence a few of the leading German firms are expected to apply for space.

California S.A.E. Stages Joint Ethyl Gas Meeting

SAN FRANCISCO, Feb. 26—The Northern California Section of the Society of Automotive Engineers' meeting last week drew the largest attendance yet recorded at any of the monthly assemblies. The affair was a joint meeting of the section with the Service Managers' Organization, the Sales' Managers' Association (passenger cars and trucks), the Accessory Buyers' Association, the Corporation Engineers' Club, and the Purchasing Agents' Association of California.

The subject was ethyl gasoline, and the program was handled by A. M. Maxwell, vice-president of the Ethyl Gas Corp. of New York, who had as speakers several of the engineers from this corporation's laboratories. Edwin C. Wood, chairman of the section presided, and W. S. Crowell, secretary, arranged the meeting.

Adopts Trackson Name

MILWAUKEE, Feb. 26—The Full-Crawler Co., division of the George H. Smith Steel Casting Co., manufacturing the Trackson full-crawler attachment for Fordson tractors, has changed its corporate title to the Trackson Co., to better identify the maker with the product. There is no change in management, organization or personnel.

Air Mail Gets One Bid

WASHINGTON, Feb. 28—The Pitcairn Aviation Co., Philadelphia, was the only bidder on the proposed New York to Atlanta commercial air mail route, it was announced this week by the Postoffice Department. The company offered to carry the mails for \$3 a pound, including equipment.

Indiana Section to Hold Diesel Session

INDIANAPOLIS, Feb. 26—The Indiana Section of the Society of Automotive Engineers will hold its sixth meeting this season, March 10, when "Development of Light, High-Speed Diesel Engines for Automotive Use" will be the subject of three papers to be presented by C. L. Cummins, president of the Cummins Engine Co. of Columbus, Ind.; W. W. Schettler, chief engineer of the Foos Gas Engine Co., Springfield, Ohio and by P. M. Heldt, technical editor of AUTOMOTIVE INDUSTRIES, who will cover the entire development subject in a review of recent achievements in this line. Both Mr. Cummins and Mr. Schettler are expected to go into details regarding Diesel types their own companies have developed.

Washington S.A.E. Meets

WASHINGTON, Feb. 26—The history of rubber from the time the tree is tapped until it is put on the market as an automobile tire was outlined to the Washington Section of the Society of Automotive Engineers by W. L. Holt, mechanical engineer at the Bureau of Standards, at a meeting here this week. Mr. Holt explained various methods of processing and vulcanizing the rubber and also explained the difference and cause for such difference between the various types of rubbers.

N.S.P.A. to Aid Groups

DETROIT, Feb. 26—Formation of local group associations of members has been approved by the National Standard Parts Association and through its new merchandising service director, T. O. Duggan, the association will aid in the formation of these groups wherever desired. Following the formation of the Chicago group, now known as Chicago Division No. 1, N. S. P. A., a division has been formed in Detroit, while earlier organizations have been effected in New York, Philadelphia, St. Louis and Los Angeles.

Calendar of Coming Events

SHOWS

Barcelona	April 27-May 8
Boston	March 5-12
Mechanics' Bldg., including special Shop Equipment Exhibit.	
Budapest	June 4-15
Cairo	Feb. 15-March 15
First International Motor Show.	
Cleveland	Sept. 19-23
Exposition, Public Auditorium, Na- tional Machine Tool Builders' Ass'n.	
Cleveland	Oct. 3-7
Exhibition, Public Auditorium, American Electric Railway Ass'n.	
Cologne	May 20-31
International Commercial Trans- port Exhibition.	
Geneva	March 4-13
Palais des Expositions.	
London	Oct. 14-22
Olympia Passenger Car Show.	
London	Nov. 17-26
Olympia Truck Show.	
New Haven, Conn.	Sept. 6-9
Machine Tool Exhibition.	

Paris	Oct. 6-16
Grand Palais.	

CONVENTIONS

American Electric Railway Association, Public Auditorium, Cleveland	Oct. 3-7
American Gear Manufacturers Associa- tion, Annual Meeting, Hayes Ho- tel, Jackson, Mich.	May 12-14
American Society of Mechanical Engi- neers, White Sulphur Springs, W. Va.	May 23-26
American Welding Society, Engineer- ing Societies Bldg., New York City	April 27-29
Automotive Equipment Association Summer Convention, Multnomah Hotel, Portland, Ore.	June 27-July 2
National Association of Automobile Show and Association Managers, Drake Hotel, Chicago	July 26-27
National Battery Manufacturers Asso- ciation, Benjamin Franklin Hotel, Philadelphia	March 10-11

National Foreign Trade Council, De- troit	May 25-27
National Safety Council, Stevens Hotel, Chicago	Sept. 26-30

Society of Automotive Engineers, Sum- mer Meeting, French Lick Springs, Ind.	May 25-28
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RACES

Abilene, Texas	July 4
Altoona, Pa.	June 11
Altoona, Pa.	Sept. 5
Atlantic City	May 7
Atlantic City	Sept. 24
Charlotte, N. C.	July 18
Detroit	Sept. 10
Indianapolis	May 30
Los Angeles	Nov. 27
Salem, N. H.	June 25
Salem, N. H.	Oct. 12
Syracuse, N. Y.	Sept. 3